REF: 9502-057-50 A1

Mortara INSTRUMENT

ELI 100 Operator's Manual

CAUTION: Federal law restricts this device for sale to and use by or on the order of a physician.

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User Safety Information

Warning:	Means there is the possibility of personal injury to you or others.
Caution:	Means there is the possibility of damage to the equipment.
Note:	Provides information to further assist in the use of the device.

Federal law restricts this device to sale by or on the order of a physician.

Warning(s)

- Device (electrocardiograph, Class 1) captures and presents data reflecting a patient's physiological condition that when reviewed by a trained physician or clinician can be useful in determining a diagnosis. However, the data should not be used as a sole means for determining a patient's diagnosis.
- To ensure that electrical safety is maintained during operation from AC (~) power, the device must be plugged into a Hospital Grade outlet.
- To maintain designed operator and patient safety, peripheral equipment and accessories used that can come in direct patient contact, must be in compliance with UL 2601-1, IEC 601-1 and IEC 601-2-25.
- To maintain designed operator and patient safety, only use parts and accessories supplied with the device and available through Mortara Instrument, Inc.
- To avoid the possibility of serious injury or death during patient defibrillation, do not come into contact with device or patient cables. Additionally, proper placement of defibrillator paddles in relation to the electrodes is required to minimize harm to the patient.
- To ensure the safety of both the patient and the device, 1.5 meters (5 feet) of open area should surround the patient.
- A possible explosion hazard exists, do not use the device in the presence of flammable anesthetics.
- ECG electrodes could cause skin irritation and should be examined for signs of irritation or inflammation.
- Before attempting to use the device for clinical applications the operator must read and understand the contents of the manual and any documents accompanying the device.
- Where the integrity of external PROTECTIVE EARTH CONDUCTOR arrangement is in doubt, EQUIPMENT shall be operated from its internal ELECTRICAL POWER SOURCE.
- To maintain operator and patient safety, when connecting the ELI 100 to peripheral equipment not in compliance with UL2601-1, IEC 601-1 or IEC 601-2-25, consideration should be given to the requirements of IEC 601-1-1.
- The ELI 100 has not been designed for use with high-frequency (HF) surgical equipment and does not provide a protective means against hazards to the patient.

- When connected to an external modem, a protective earth conductor must be attached to the ELI 100. The connection may be through the mains power supply cord, or by a separate protective earth conductor attached to the metal chassis of the ELI 100. The external modem and its power supply must comply with the requirements of IEC 60950, safety of information technology equipment, including electrical business equipment.

- Leakage currents can increase if additional devices are connected to the patient.

- All signal input and output (I/O) connectors are intended only for devices complying with EN 60601-1, excluding the network connectors(s), that must only be used for connections to supporting Mortara Instrument systems when cabling is supplied or approved by our Mortara Instrument Representative.

- Connecting/disconnecting cable at the back of the device must be done with the device OFF (main power).

Caution(s)

- To prevent possible damage to the keypad, do not use sharp or hard objects to depress keys, only use fingertips.

- Do not attempt to clean the device or patient cables by submersing into a liquid, autoclaving, or steam cleaning.

- Wipe the exterior surface of the device and patient cables with a sterilizing disinfectant, then dry with a clean cloth.

- Conductive parts of the patient cable, electrodes and associated Type CF connections, including the neutral conductor of the patient cable and electrode, should not come into contact with other conductive parts, including earth ground.

- The rechargeable internal battery is a sealed lead acid type and it is totally maintenance free. If the battery appears to become defective, refer to Mortara Instrument Service Department.

- Do not pull or stretch patient cables as this could result in mechanical and/or electrical failures. Patient cables should be stored after forming them into a loose loop.

- The quality of the signal produced by the electrocardiograph may be adversely affected by the use of other medical equipment, including but not limited to defibrillators and ultrasound machines.

Notes

- Excessive patient movement could interfere with the operation of the device.
- Proper patient preparation is important to proper application of ECG electrodes and operation of the device.
- Patient cables should be checked for cracks or breakage in its exterior properties prior to use.
- There is no known safety hazard if other equipment, such as pacemakers or other stimulators, are used simultaneously with the ELI 100; however, disturbance to the signal may occur.
- If the ECG input becomes inoperable due to excessive saturation or overload, the display will indicate a lead fail for the lead(s) that this condition is present and if the signal is being printed the respective lead(s) will print out as a square wave.
- As defined by IEC 601-1 and IEC 601-2-25, the device is classified as follows:
  - Class I equipment
  - Type CF applied parts
  - Ordinary equipment
  - Not suitable for use in the presence of flammable anesthetics
  - Continuous operation
- The ELI 100 will automatically turn off (blank screen) if the batteries have been severely discharged.
- After operating the ELI 100 using battery power, always reconnect the power cord and depress the I on the I/O power switch. This ensures that the batteries will be recharged for the next time you use the ELI 100. The word CHARGING or AC Power will appear on the LCD screen.

Equipment Symbols

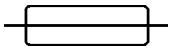
Symbol Delineation

Attention, consult accompanying documents

Alternating current

Protective earth (ground)

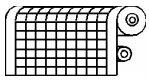
Earth (ground)



Fuse

Telephone line (modem)

Defibrillator-proof type **CF** input



Thermal paper

Equipotentiality

Output/Transmit

Input

ON (power)

OFF (power)

"ON" only for part of Equipment

"OFF" only for part of Equipment

Stop (of action)

Shift key (to enter upper case text)

Space key

Enter key (accept data/return)

Backspace/Delete key

Initiate printing of 12-Lead ECG

Initiate printing of continuous rhythm strip

High-speed serial data

Eject

Indicates compliance to applicable EEC directives

Table of Contents

1 Introduction

Manual Purpose 1-1
Audience 1-1
Conventions 1-1
System Description 1-1
ELI 100, Illustration 1-2
ELI 100 Specifications 1-3
Setup and Installation 1-4
ELI 100, Two Views: Left Side and Rear 1-4
Rear (Fuse Installation) 1-5
Configuration Settings 1-5
Initial Configuration 1-7
Protected Configuration 1-7
Protected Configuration Screen Summary 1-8
Protected Configuration Screen A 1-8
AC Filter 1-8
Storage Format 1-8
Protected Configuration Screen B 1-9
Storage Sensitivity 1-9
Protected Configuration Screen C 1-9
Plot Format 1-9
Interpretation Format 1-9
Protected Configuration Screen D 1-10
Plot Channels 1-10
Protected Configuration Screen E 1-11
Units 1-11
Date Format 1-11
Protected Configuration Screen F 1-11
Baud Rate 1-11
Auto Delete 1-12
Protected Configuration Screen G 1-12
Serial Port 1-12
CAPS Lock 1-12
Protected Configuration Screen H 1-12
Pre-append site number to patient ID 1-13
Protected Configuration Screen I 1-13
Phone Number 1-13
Protected Configuration Screen J 1-14
Internal Modem Baud Rate 1-14
Protected Configuration Screen K 1-14
Auto Save 1-14
Cueing 1-14
Protected Configuration Screen L 1-15
Site Number 1-15
Cart Number 1-15
Copies 1-15
Retrieve Serials 1-15
Protected Configuration Screen M 1-15
ID Format 1-16
Protected Configuration Screen N 1-16
Rhythm Lead Selection 1-17

Protected Configuration Screen O....1-17
Site Name....1-17
Protected Configuration Screen P....1-17
Key Click Volume Setting....1-18
Persistent Configuration....1-19
Load Thermal Paper....1-20
Apply Power....1-20
ELI 100 Supply List....1-21
100

2 Operation

Starting the System....2-1
Operation....2-1
AC Power Operation....2-1
Battery Operation....2-1
Patient Preparation....2-2
Patient Hookup....2-2
ID Menu Formatting....2-2
Selecting the ID Menu....2-3
ID Menu Prompts....2-3
ID Menu Sequence (Long Format)....2-5

3 Acquiring and Printing a 12-Lead ECG

ECG Selection Screen Description....3-1
ECG Analysis....3-2
ECG Activity Screen Description....3-2
Taking a Second ECG....3-3
Selecting an E-SCRIBE Patient File....3-4
Request Selection Screen....3-4

4 Acquiring and Printing a Rhythm Strip

Rhythm Selection Screen Description....4-1
Acquiring Routine Rhythm Strips....4-1
Rhythm Activity Screen Description....4-1

5 Using the Special Functions

Special Function Screen Description....5-1
Directory Description....5-1
Printing a Directory....5-2
Directory Screen Sequence....5-2
Patient Selection Screen Description....5-4
Selecting a Patient Name....5-4
Erasing a Patient's ECGs....5-4
Listing a Patient's ECGs....5-5

Selecting a Specific ECG 5-5
Patient ID Screen Description 5-5
Erasing a Specific ECG 5-6
Maintenance on a Specific ECG 5-6
Directory Maintenance Screen Description 5-6
Updating or Adding Patient ID Information 5-7
Transmitting ECGs 5-7
Direct Connection Hookup 5-7
Telephone Connection Hookup 5-7
Sending ECGs 5-8
Receiving ECGs 5-8
Batch Plotting 5-9
Downloading a Request List 5-9
Request Activity Screen Description 5-9
Printing the Request List 5-10

6 Maintenance and Troubleshooting

Troubleshooting Chart 6-1
Self-Test Printout Description 6-2
Self-Test Printout Sample, Pg. 1 of 2 6-3
Self-Test Printout Sample, Pg. 2 of 2 6-4
Cleaning and Inspection 6-5
Inspecting the ELI 100 6-5
Cleaning the ELI 100 6-5
Cleaning the Patient Cable 6-5
Cleaning the Writer Printhead 6-5

Appendix A System Information Log

System Information Log A-1

Appendix B Sample Print Formats

Rhythm Strip (RHY) Description B-1
3-Channel ECG Format Description B-1
4-Channel ECG Format Description B-1
6-Channel ECG Format Description B-1
3+3 ECG Format Description B-2
Measurement Matrix (MSR) Description B-2
Measurement Matrix Acronym List B-2
Standard Rhythm Strip Sample (default, reduced) B-4
6-Channel Frontal Rhythm Sample (reduced) B-5
6-Channel Precordial Rhythm Sample (reduced) B-6
12-Channel Rhythm Sample (reduced) B-7
3-Channel ECG Sample (reduced) B-8
4-Channel ECG Sample (reduced) B-9
6-Channel ECG Sample (reduced) B-10
3+3 ECG Sample (reduced) B-11
Measurement Matrix Sample (reduced) B-12

Glossary G-1

Index I-1

Figures

Figure 1-1 ELI 100 1-2
Figure 2-1 ELI 100 Left and Rear 1-4
Figure 3-1 ELI 100 Rear (Fuse Installation) 1-5

1 Introduction

Manual Purpose

The ELI 100 Operator's Manual explains how to operate the ELI 100 interpretive and non-interpretive electrocardiographs. You can use this manual as a learning tool as well as a source of reference information. It explains how to:

- Set up the electrocardiograph.
- Use and understand the keyboard, the viewing screen, and the menu sequences.
- Enter, modify, and delete information.
- Acquire a 12-lead electrocardiogram
- Print an ECG rhythm strip

Audience

This manual is written for clinical research professionals. They are expected to have working knowledge of medical procedures and terminology as required for monitoring cardiac patients.

Conventions

Text that the user must type, such as **a:install**, appears in bold, Times New Roman font.

Keys, such as **ENTER**, appear in bold, upper-case, Arial font.

Text that appears on the screen, such as C:\Portrait, appears in normal, Arial font.

System Description

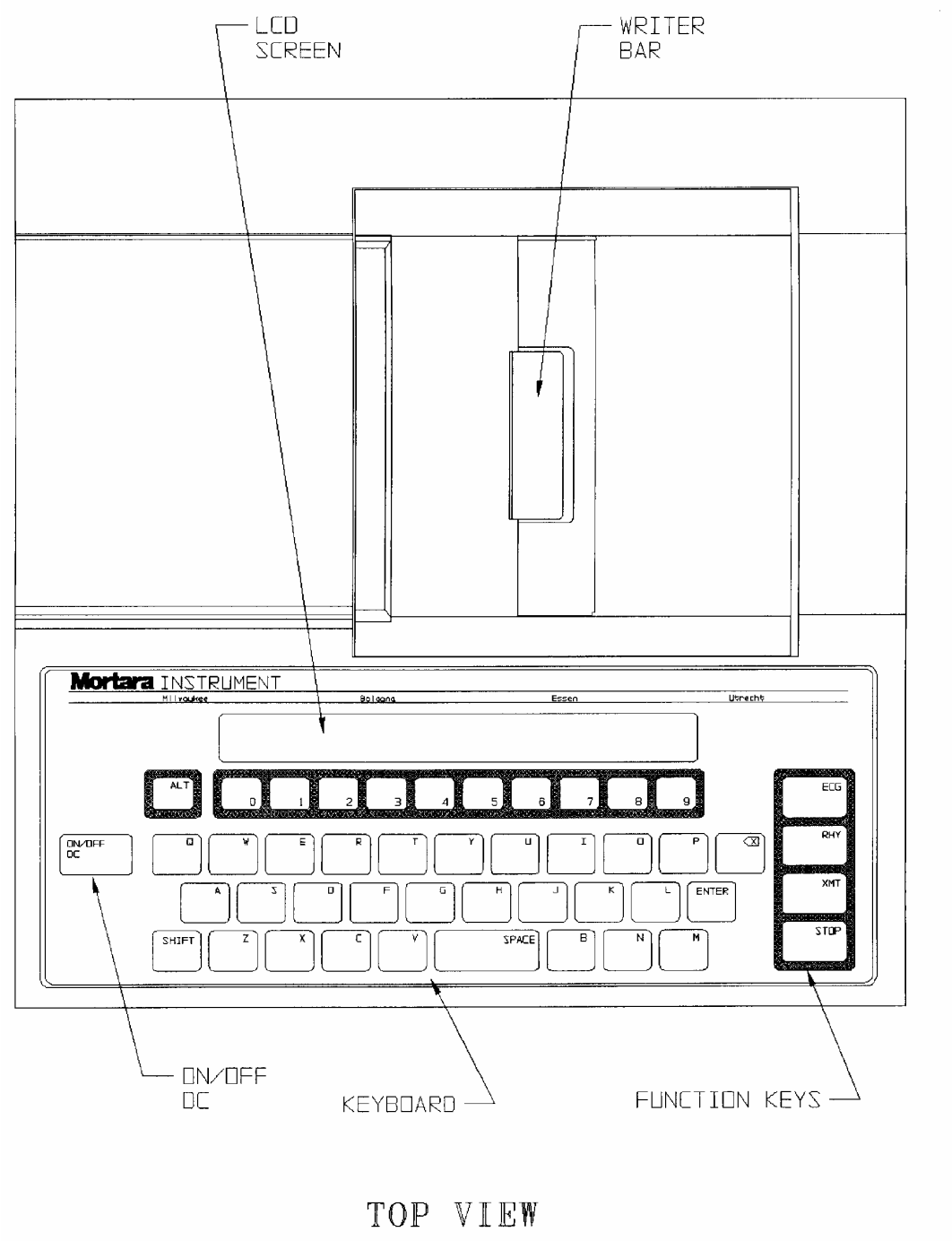
The ELI 100 is a diagnostic electrocardiograph capable of acquiring and printing ECG data in a hospital and/or clinical environment. If the ELI 100 is equipped with the computerized interpretation option installed and is enabled, which is at the user's discretion, the acquired electrocardiogram may assist in allowing the physician to more quickly determine what care options may be available for the patient.

The printout offers a variety of formats: three, four or six channels in automatic mode and three, six, or twelve channels during rhythm recording. The ELI 100 can operate on batteries or line power.

The ELI 100 consists of:

- Electrocardiograph
- ELI 100 Operator's Manual and short form instruction card
- Accessory Kit

Figure 1-1, ELI 100, Illustration



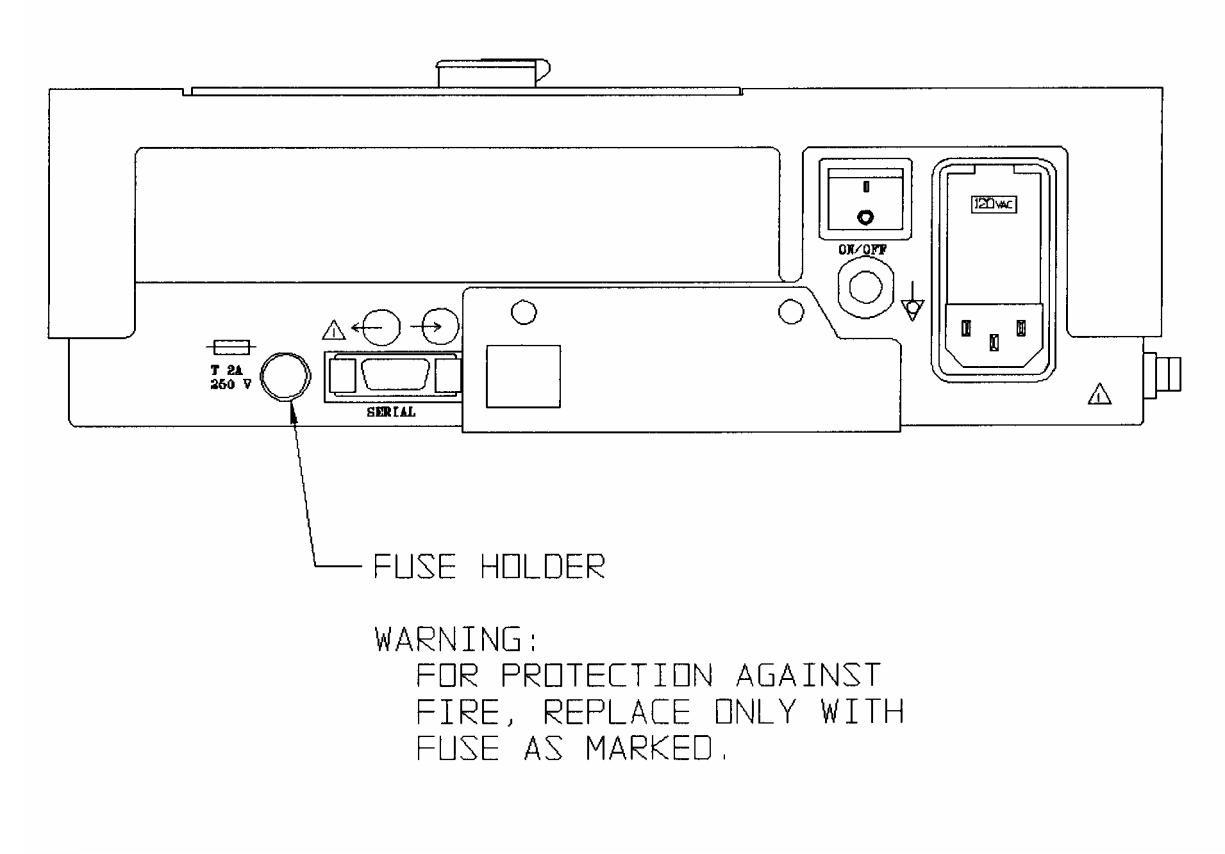
TOP VIEW

ELI 100 Specifications

Leads available:	I, II, III, aVR, aVL, aVF, V1, V2, V3, V4, V5, V6
ECG input:	Simultaneous input from all 12 leads
Input impedance:	Meets the requirements of ANSI/AAMI EC11
Input dynamic range:	Meets the requirements of ANSI/AAMI EC11
Electrode offset tolerance:	Meets the requirements of ANSI/AAMI EC11
Common mode rejection:	Meets the requirements of ANSI/AAMI EC11
Patient leakage rejection:	Meets the requirements of ANSI/AAMI ES1
Chassis leakage current:	Meets the requirements of ANSI/AAMI ES1
Frequency response:	Meets the requirements of ANSI/AAMI EC11
Digital sampling rate:	10,000 samples/sec/channel (used for pacemaker artifact detection); 500 samples/sec/channel (used for recording and analysis)
Special computer functions:	Arm lead reversal detection; lead-off and/or artifact detection; drift reduction; AC interference rejection
Power:	100-240VAC at 50 or 60Hz, or internal batteries
Weight:	11 pounds (4.9kg)
Dimensions:	11 1/4” x 11 1/2” x 3 3/4” (28.1 x 28.7 x 9.3 cm)
Recording technique:	Computer controlled thermal dot array (200 dots/inch)
Paper type:	Thermal sensitive, full grid, 108mm width, roll
Recording speeds:	5, 10, 25, 50mm/sec, computer controlled
Recorder time resolution:	1msec
Sensitivity:	5, 10, and 20mm/mV

Setup and Installation

Figure 2-1, ELI 100



Caution: When the fuse is installed, battery will gradually discharge over time. To guarantee battery life, always connect the power cord and depress the I on the I/O power switch to ensure the batteries will be recharged for your next use. The word CHARGING or AC Power will appear on the LCD screen. If fuse is removed, stored data and configuration settings will be lost.

100The battery fuse is installed in the back of the unit, as pictured above. The fuse is installed so the ELI 100 can store data, operate on the internal battery, and save the configuration settings.

One end of the fuse is covered with a plastic tip; the other end has a silver cap. If a new fuse needs to be installed, follow the steps below:

❶ Hold the fuse by the plastic tip and insert the silver-capped end into the round socket, which is located near the fuse "Warning" instructions on the back of the ELI 100.

❷ Rotate the fuse in the socket so that approximately 1/4" of the plastic cap sticks out.

❸ In a clockwise motion, press the plastic cap into the socket using your thumb or a screwdriver. The cap should be almost flush with the unit.

NOTE: If you remove the battery fuse after the ELI 100 is in operation, any ECGs stored in the unit will be lost and the initial and protected configuration settings will change to their default settings. The persistent site and cart number configuration settings will be preserved.

NOTE: If the main switch is ON and the LCD (Liquid Crystal Display) does not display "charging" or "AC Power," have a qualified service technician verify that the line fuse(s) are installed.

Configuration Settings

Three configuration programs define all ELI 100 operational conditions:

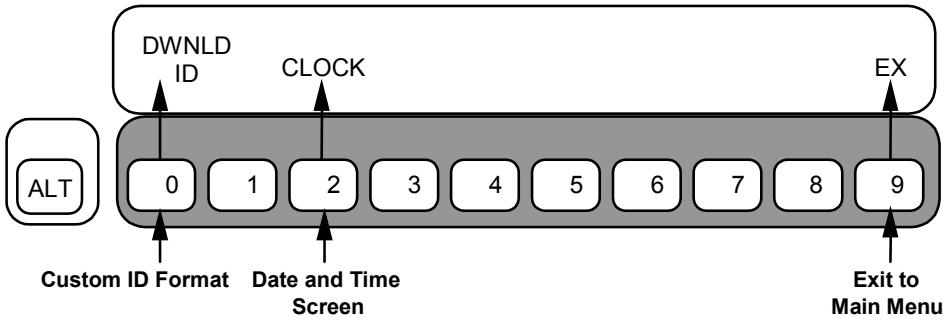
1. **Initial Configuration**
    a. Download Custom ID
    b. Clock and Date settings

2. **Protected Configuration**
    a. AC Filter, Storage Format
    b. Storage Sensitivity
    c. Plot Format, Interpretation Format
    d. Plot Frequency and Plot Channels
    e. Units, Date Format
    f. Baud Rate, Auto Delete
    g. Serial Port, Caps Lock
    h. Include Site # in ID
    i. Phone Number
    j. Auto Save, Cueing
    k. Copies, Retrieve Serials
    l. ID format
    m. Rhythm Lead Selection
    n. Site Name
    o. Key Click

3. **Persistent Configuration**
    a. Site Number
    b. Cart Number

Initial Configuration

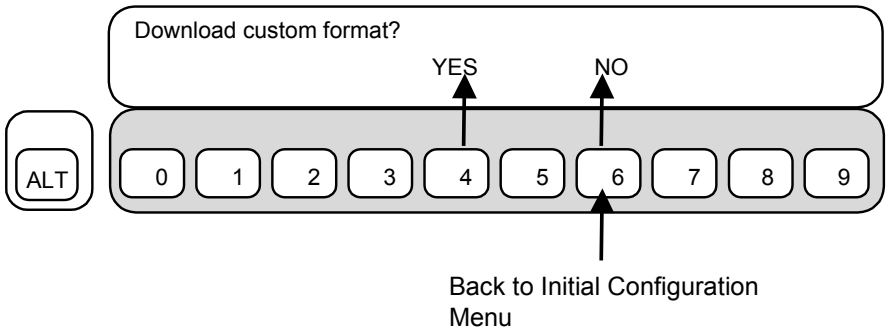
The initial configuration menu allows the user to download a custom ID and change the date and time settings. To access the initial configuration menu, press the **ALT** key and the **SPF** (0) key simultaneously from the main menu. The following initial configuration menu appears:



NOTE: To access the Protected Configuration and Persistent Site Number Configuration menus, you must begin from the initial configuration menu as pictured above. Details to access the protected and persistent configuration menus follow.

The custom ID format, which is designed in the E-SCRIBE system, can be downloaded to the ELI 100. When you select (0) **DWNLD ID**, the following screen appears:

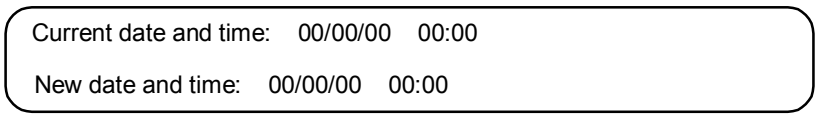
NOTE: The site number must be configured in the cardiograph and recognized as an established, valid site number at the E-Scribe before downloading the custom ID.



Select (4) **YES** to proceed with the download – the screen will display the following message: "connection in progress". When the download completes, the new CUSTOM format becomes the ID menu format for all future ECGs until you reconfigure the ID format. If you reset the format option to SHORT, STD, or LONG in the protected configuration menu, and then wish to change back to an original or a new CUSTOM format, you must repeat the download process from the initial configuration menu.

NOTE: CONNECTION FAILURE will be displayed if there was an error in downloading the custom ID.

Press the **CLOCK** key (2) to access the Clock/Date Selection screen shown below.



❶ The top line of the LCD screen displays the preprogrammed current date and time set for the ELI 100.
❷ To reset the clock, type in the correct date and time (using a 24-hour clock) in the same format as displayed.

US EXAMPLE: 12/31/89, 17:55 for December 31, 1989, 5:55 PM

NOTE: the date format (US or EUROPE) can be switched in the protected configuration settings.

Protected Configuration

The protected configuration menu allows the user to define the ELI 100 operational conditions that do not change on a daily or patient-to-patient basis. Once you set these default conditions, you will rarely need to use the protected configuration program again. To access the protected configuration menu, press the **ALT** key and the **C** key simultaneously from the initial configuration menu.

The chart below summarizes the protected configuration menu screens and the available options for each parameter. Detailed descriptions of the parameters for each menu option(s) follow the summary chart..

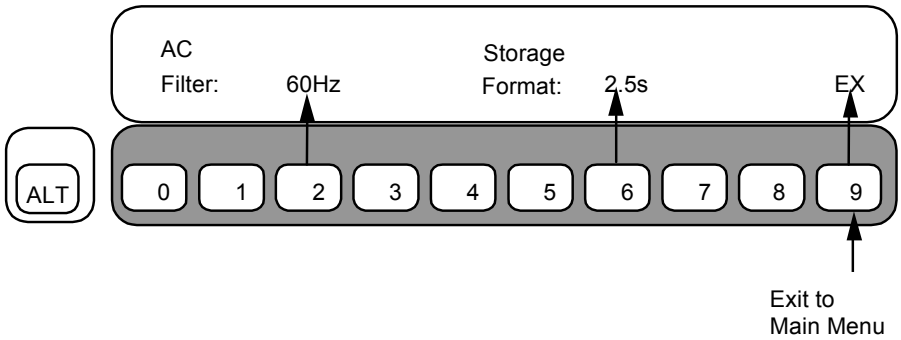
Protected Configuration Screen Summary

Screen	Parameter	Option
A	AC Filter Storage Format	60Hz or 50Hz 2.5 seconds or 10 seconds
B	Storage Sensitivity	2.5 micro-volts or 10 micro-volts.
C	Plot Format Interpretation Format	Interpretation or No Interpretation Reason Statements or No Reason Statements100
D	Plot Frequency Plot Channels	40Hz or 150Hz 3+3 (2pg), 3, 4
E	Units Date Format	LB/IN or kg/cm US or European
F	Baud Rate Auto Delete	38400 XMT, XMT/PLT, IMMED, OFF, PLT
G	Serial Port Caps Lock	Direct or Modem On or Off
H	Include Site # ID	Yes or No
I	Phone Number	User-defined (up to 40 characters including special characters)
J	Modem Baud Rate	1001100 or 2400
K	Auto Save Cueing	ON or OFF ON or OFF

L	Site Number	Display only
	Cart Number	Display only
	Copies	0 = Original copy 1 = Original plus one copy x = Original plus up to nine copies
	Retrieve Serials	0 = Most recent ECG (value should always be set to 0).
M	ID Format	LONG, SHORT, CUSTOM, STD
N	Rhythm Lead Selection	Channel 1, Channel 2, Channel 3: I, II, III, aVR, aVL, aVF, V1-V6
O	Site Name	User-defined (up to 32 alphanumeric characters)
P	Key Click	Soft, Medium, Loud

To advance from one configuration screen to the next, press the **ENTER** key. Select (9) **EX** from any protected configuration screen to return to the initial configuration screen.

Protected Configuration Screen A



AC Filter

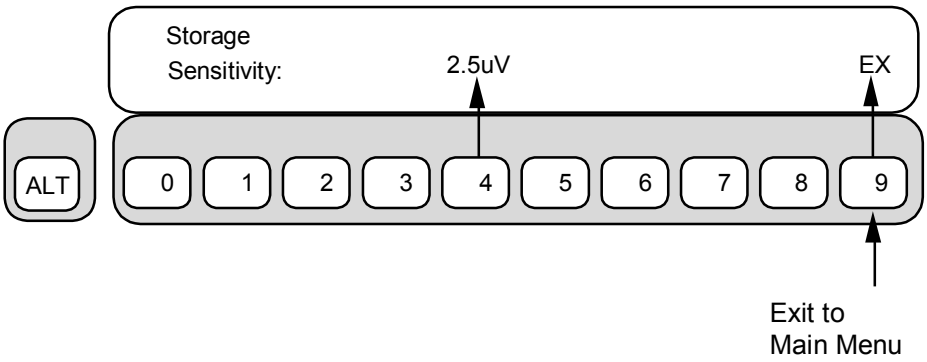
The ELI 100 software removes 60Hz or 50Hz interference. Which setting you select depends on the line frequency in your country. Always use the 60Hz setting in the United States. If the AC interference is present, check to see that the proper AC filter is selected.

Storage Format

There are two available storage format options in the ELI 100. One format stores 2.5 seconds of each of the twelve leads. The other storage format option, which is the default setting, stores the full 10 seconds of all twelve leads. Selecting this storage format option will reduce the amount of storage. For optimum storage capacity, select 2.5 seconds.

Most users select the 2.5 second storage format since it provides the standard 12-lead record. If the default Plot Channels option is set to 4 channels (see Configuration Screen C), the 2.5 second format is modified so that 10 seconds of Lead II is stored along with 2.5 second segments of the remaining leads.

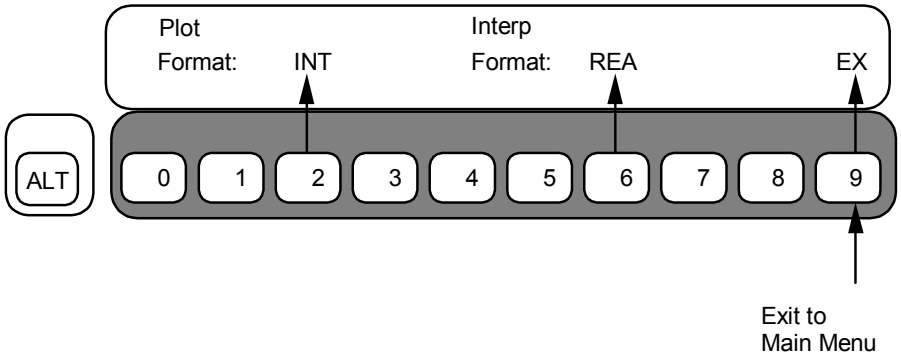
Protected Configuration Screen B



Storage Sensitivity

The default storage sensitivity is 2.5 uV. For optimum storage capacity, select 10 uV.

Protected Configuration Screen C



Plot Format

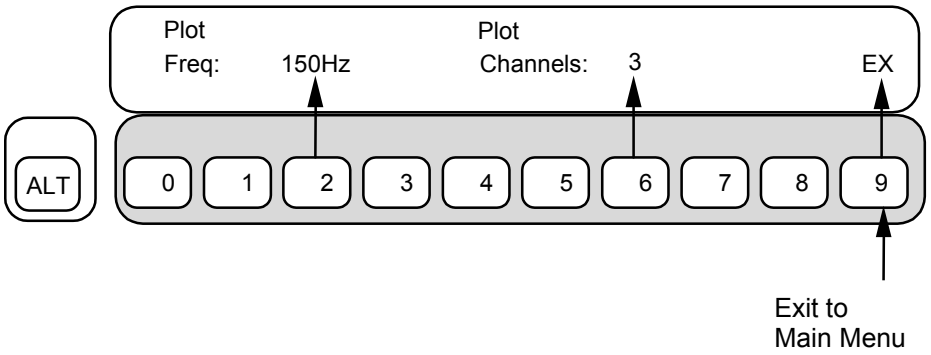
The ELI 100 automatically analyzes ECGs and prints the interpretation on the ECG printout. The Plot Format option allows you to select or suppress the "interpretive" text on the ECG report.

NOTE: A qualified physician should review the computer generated ECG interpretation before the treatment of any patient.

Interpretation Format

The reason statements indicate why a particular interpretive statement was printed. Reason statements print in [square brackets] within the interpretive text (if the interpretation is turned on). Turning the reason statement function on or off does not affect the measurements performed or the interpretive statements selected by the analysis program. See *Appendix B* for examples of the reason statements on the sample printouts.

Protected Configuration Screen D



The ECG plot frequency default setting is 150Hz, or select 40Hz. The recommended setting is 150Hz.

Plot Channels

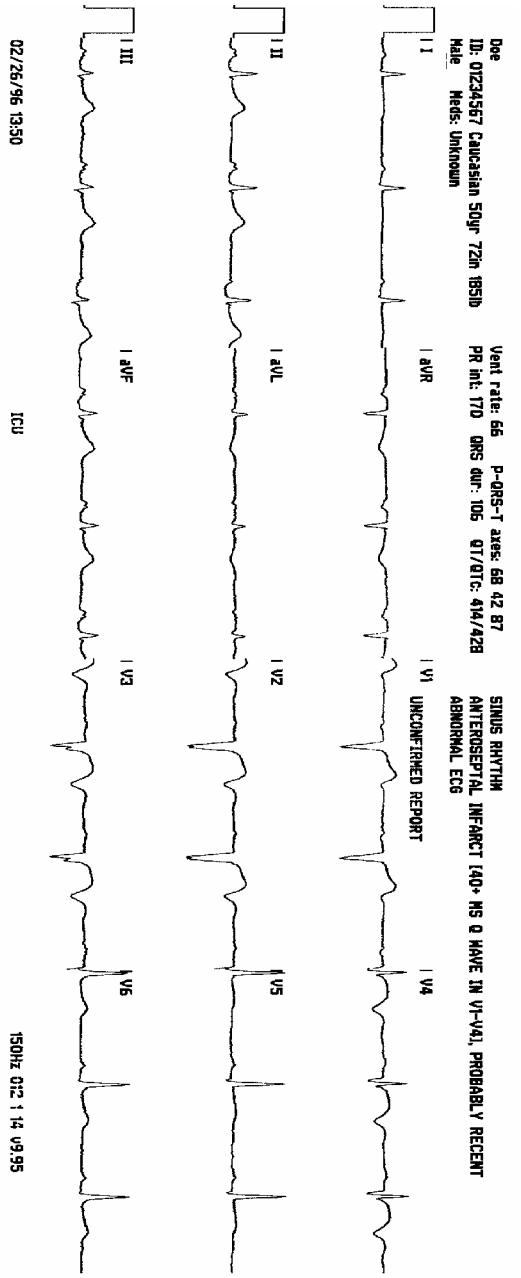
This option defines the default for the available plot channels. The plot options are:

Format Option	ECG Data
STD (Standard)	2.5-second graph of 12 leads in a 3-channel format
4CH	Condensed graph of 12 leads in a 4-channel format (3 channels contain a labeled median complex; 4th channel is a 10-second rhythm strip of Lead II)
2PG (Two Page)	Standard format PLUS a 3-channel 10-second strip of each Leads V1, II, V5

STD Format Option

The STD (standard) format is a 4" by 11" strip containing a 2.5-second graph of 12 leads in a 3-channel format.

The following print is an example of the STD format:

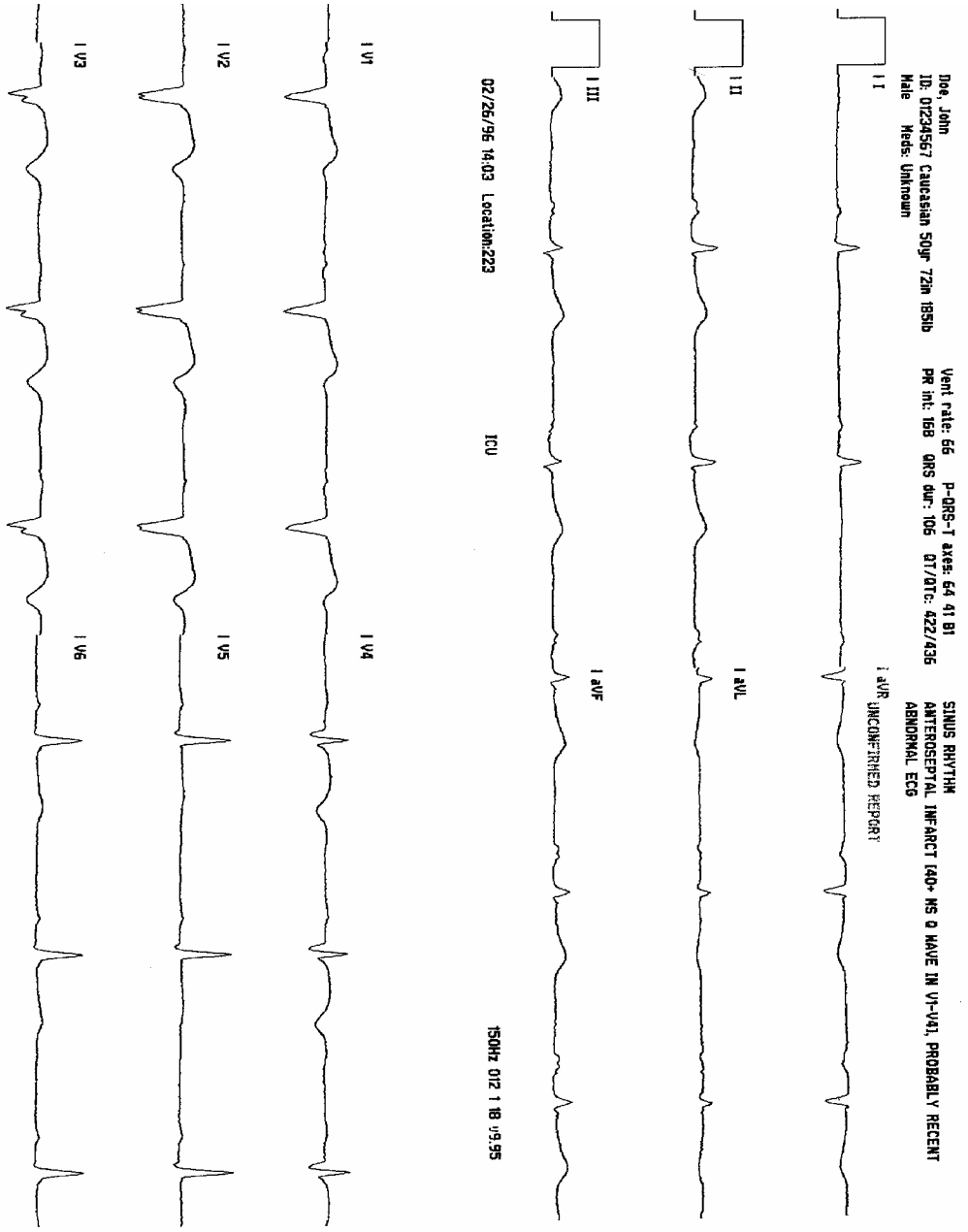


The patient's name, ID number, race, age, height, weight, gender and medications are printed across the top left section of the printout. Measurements are printed in the middle to include ventricular rate, P-QRS-T axes, PR interval, QRS duration and QT/QTc. On the top right of the printout, the ECG interpretation and reason statements are printed.

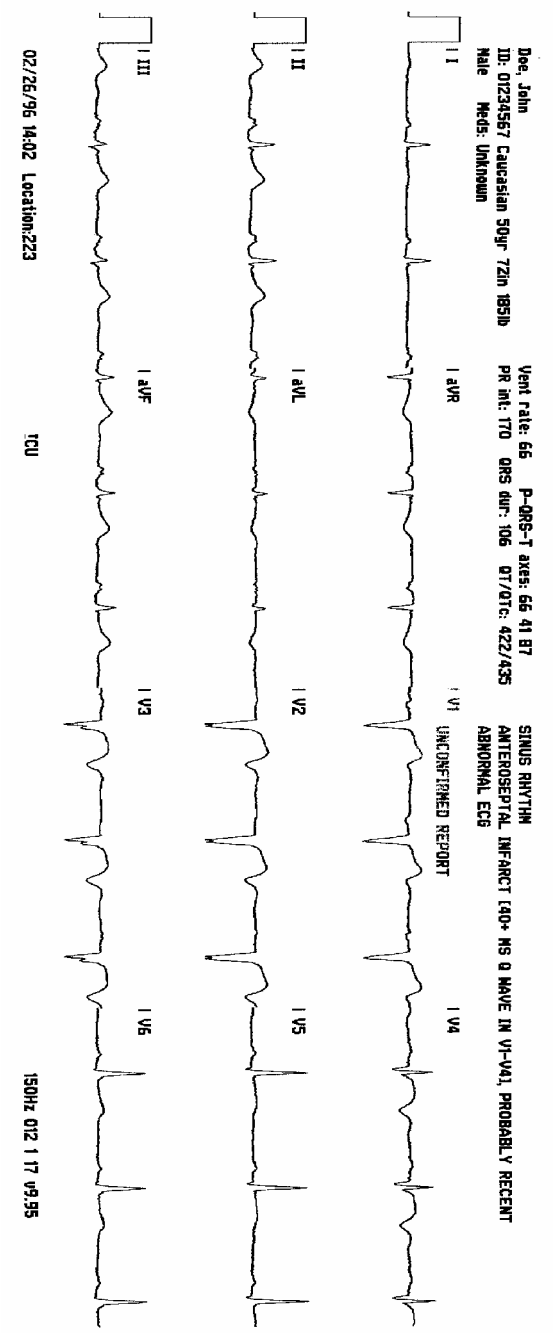
The date and time of acquisition, location, plot frequency, and software version are printed across the bottom of the printout.

Two and one-half seconds of leads I, II, III are printed after the calibration pulse, followed by two and one-half seconds each of the lead sets aVR, aVL, aVF, V1, V2, V3, V4, V5, V6.

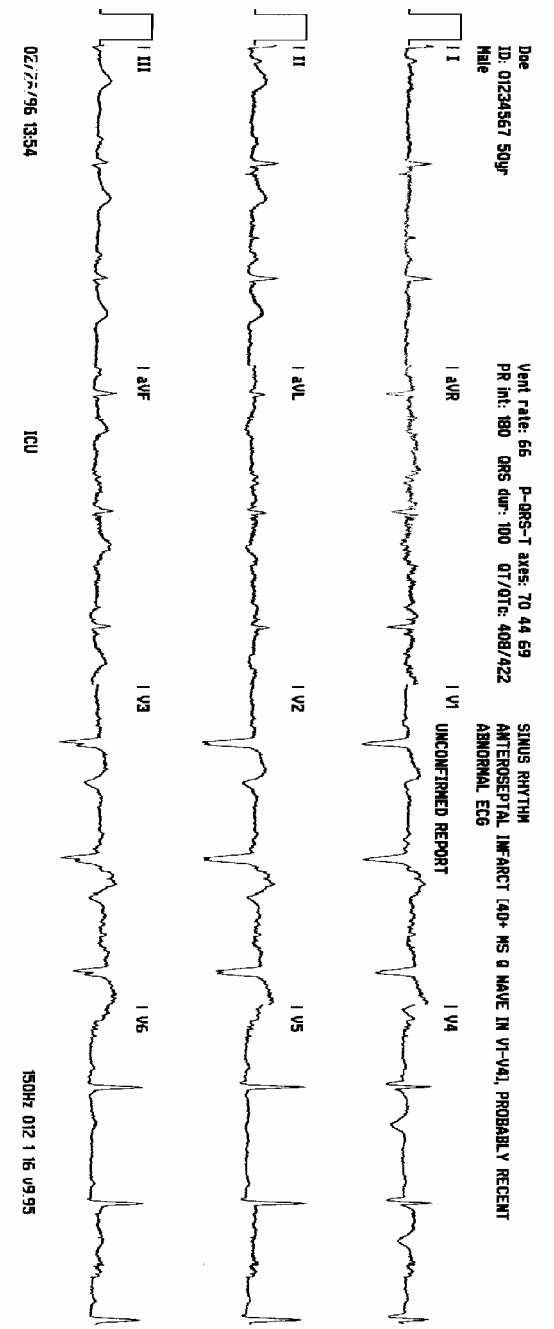
STD Format at 50 mm/sec



STD Format with Long ID



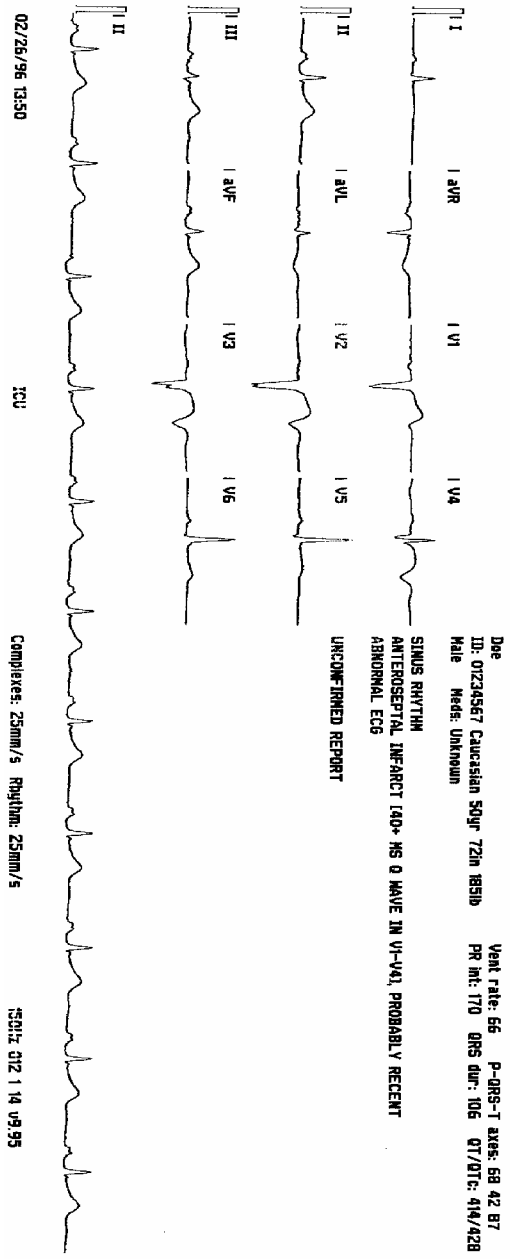
STD Format with Short ID



4CH Format Option

The 4CH (short) format is a 4" by 11" strip containing a condensed graph of the 12 leads in a 4-channel format. Three channels contain a labeled median complex for each of the 12 leads, and the fourth channel contains a 10-second rhythm strip of lead II.

The following print is an example of the 4CH format:



The patient's name, ID number, race, age, height, weight, gender and medications are printed to the right of the 12 median complexes. Measurements to include ventricular rate, P-QRS-T axes, PR interval, QRS duration and QT/QTc are printed to the right of the patient ID information. The ECG interpretation and reason statements are printed below the patient ID information.

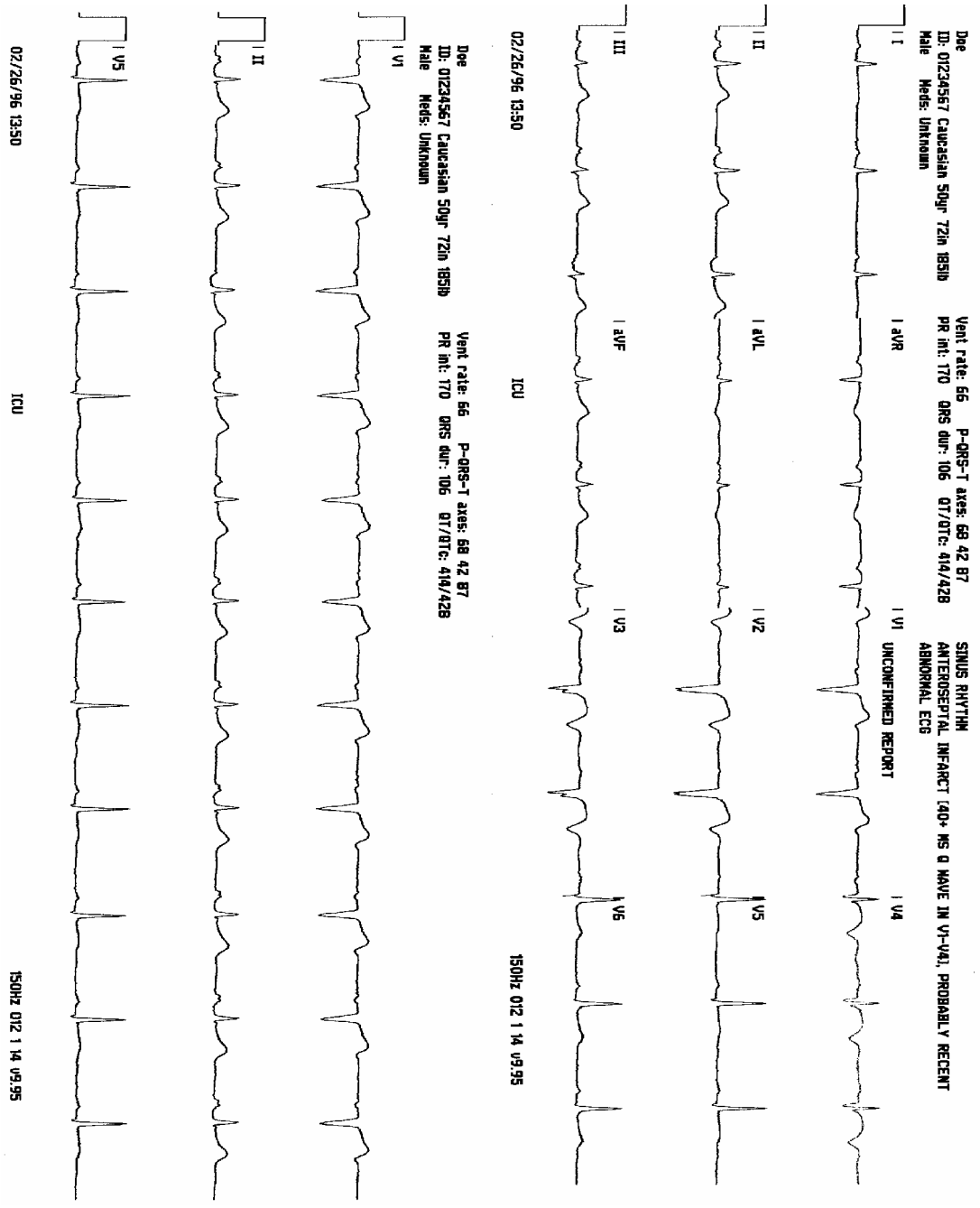
The date and time of acquisition, location, writer speed for the median complexes and rhythm strip, plot frequency and software version are printed across the bottom of the printout.

The median complexes are arranged in columns or leads I, II, III; aVR, aVL, aVF; V1, V2, V3; and V4, V5, V6.

Ten seconds of lead II are printed below the median complexes.

2PG Format Option

The 2PG (two-page) format is a 4" by 22" strip containing one page in the STD format (refer above) followed by one page containing 3 channels of rhythm leads II, V1, and V5.
The following print is an example of the 2PG format:



The patient ID information, measurements, ECG interpretation, acquisition time, location, writer speed and software version number are printed on the rhythm strip in the same format as the STD format.

MSR Format Option

The MSR format option is available when selecting a copy (CPY) of an ECG from the ECG Print Option screen or ECG Maintenance screen, *Section 5*. This option is not available when selecting a plot channel format in Configuration screen D.

The MSR (measurement matrix) option is a table listing the amplitude and interval measurements. The amplitude measurements are printed in microvolts [µV], and the interval measurements are printed in milliseconds [ms].

The following print is an example of the MSR format:

Doe/01234567 02/26/96 13:50

	I	II	III	aVR	aVL	aVF	V1	V2	V3	V4	V5	V6
PA	60	120	87	2	20	90	27	27	35	47	62	72
PPA	-5			-88	-45		-40	-8				-3
QA	28			460	60		813	910	670	313	98	28
QD	21			106	33		94	96	97	40	27	21
EQD	11			122	29		122	127	120	47	22	6
RA	445	505	210		225	347				482	1077	957
RD	85	106	48		48	106				24	79	85
SA			85							123		
SD			21							30		
RPA												
RPD												
SPA												
SPD												
STJ	18	48	30	-35	-5	40	49	74	58	50	41	38
STM	30	67	37	-50	-3	52	87	140	112	87	50	37
STE	37	117	80	-78	-20	100	132	187	147	102	72	47
TA		285	240	-168	-98	262	232	227	-268	-193		137
TPA							-43	-188				
MTA		168	160	-140	-98	162	-175	-375	-415	-295		90
QRSA	261	389	124	-335	68	258	-820	-1131	-727	-50	596	669
FLAG		1	1			1						1

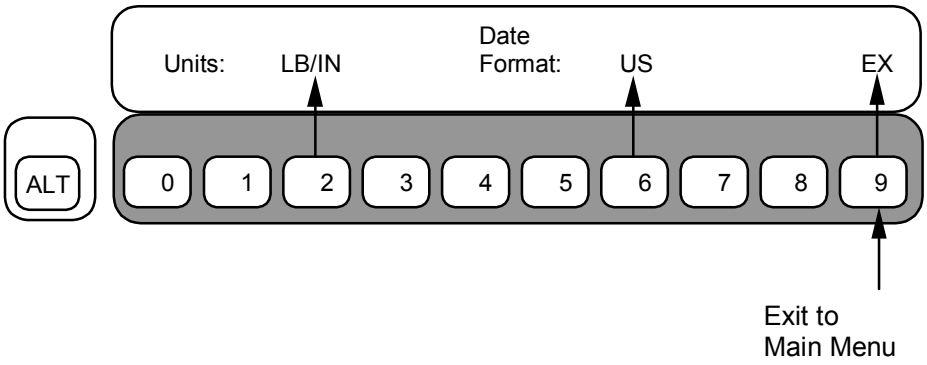
c10000000000000000000000000200082020000bfebef0aa803ea000015010000000000000000000000000015

	I II III aVR aVL aVF V1 V2 V3 V4 V5 V6
PA	P wave amplitude [µV]
PPA	P' amplitude (second phase of a biphasic P) [µV]
QA	Q wave amplitude [µV]
QD	Q wave duration [ms]
EQD	Equivalent Q duration [ms]

RA	R wave amplitude [µV]
RD	R wave duration [ms]
SA	S wave amplitude [µV]
SD	S wave duration [ms]
RPA	R' wave amplitude [µV]
RPD	R' wave duration [ms]
SPA	S' wave amplitude [µV]
SPD	S' wave duration [ms]
STJ	ST segment displacement at J point [µV]
STM	ST segment displacement at the mid-point between STJ and STE [µV]
STE	ST segment displacement at the end (defined as 1/8 the average R-R interval from J point) [µV]
TA	T wave amplitude [µV]
TPA	T' amplitude [µV]
MTA	Modified T amplitude [µV]
QRSA	Net QRS area
FLAG	Measurement Matrix Flags 1 = T inflection 2 = Delta waves 3 = 1 and 2

The leads are printed across the top of the printout, and the appropriate acronyms for the measurements are printed in a column at the left of the page.

Protected Configuration Screen E



Units

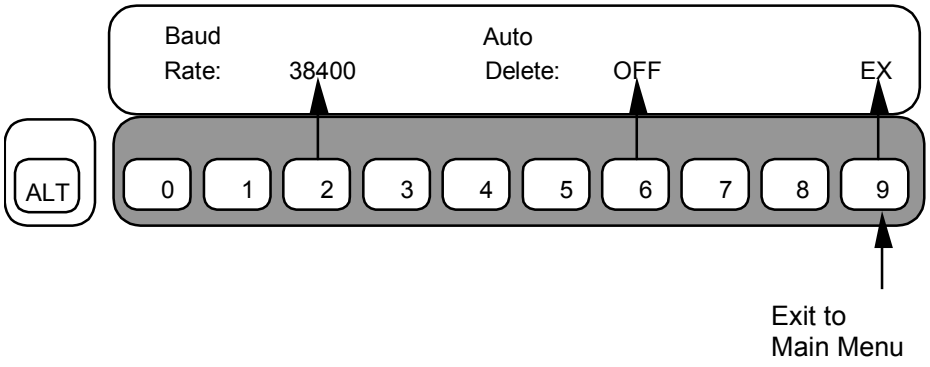
This option defines the units of weight and height to either pounds/inches (LB/IN) or kilograms/centimeters (kg/cm).

Date Format

This option defines the format for displaying the date and time in either the U.S. format (12/31/98; 17:50) or the European format (31.12.98; 17:50).

NOTE: To change the date (and time) select (2) CLOCK from the initial configuration menu as explained earlier in this chapter.

Protected Configuration Screen F



Baud Rate

The baud rate determines the serial port's data transmission rate in bits per second (bps). The baud rate is set to 38400 bps for direct data transmission between the ELI 100 and another unit; and for a direct connection to the E-SCRIBE system; and for use with an external modem.

Auto Delete

This option defines the ECG auto delete status in the directory. Deleted ECGs will be removed as the directory becomes full. The selections are:

OFF = ECG is never automatically deleted from the directory.

PLT = ECG is automatically deleted from the directory after plotting.

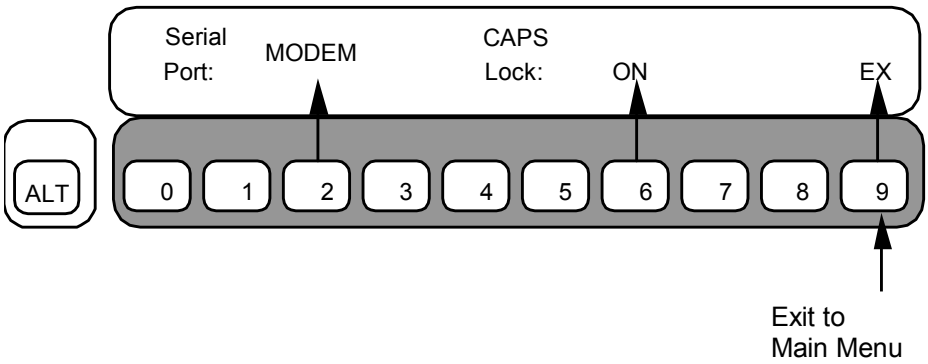
XMT = ECG is automatically deleted from the directory after transmission.

XMT/PLT = ECG is automatically deleted from the directory after transmission and plotting.

IMMED = ECG is automatically deleted.

NOTE: The initial ECG printout does not activate the procedures described above for the plot option.

Protected Configuration Screen G



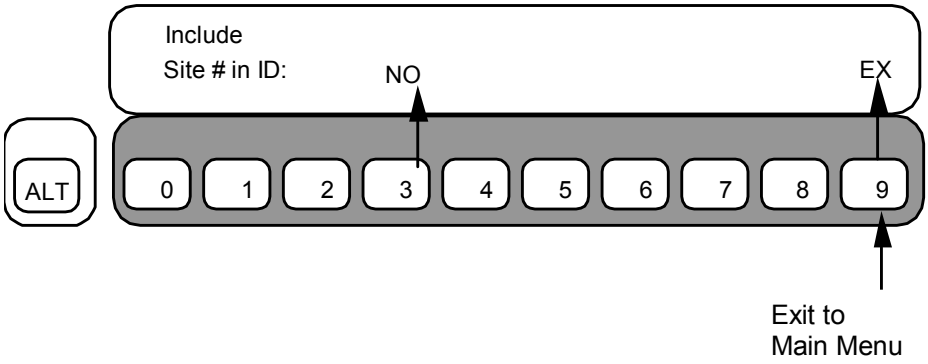
Serial Port

This option specifies the serial port mode by either direct connection or external modem. If an internal modem is present, the cardiograph will check for a dial tone and use it by default.

CAPS Lock

When the CAPS lock is on, all characters shall be translated to upper case, and the shift key shall cause the characters to be lower case. The default setting is on.

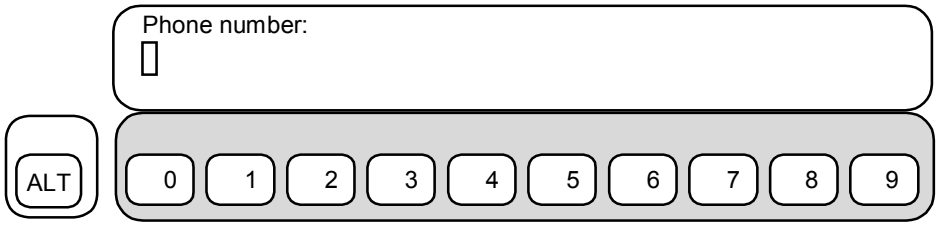
Protected Configuration Screen H



Pre-append site number to patient ID

When yes is selected for this configuration setting, the site ID, followed by a dash, will be displayed when the user enters the patient ID. The user will not be able to erase the site ID and dash before entering the patient ID. The patient ID with the site ID pre-appended shall become the true patient ID and be displayed that way whenever the patient ID is displayed and printed.

Protected Configuration Screen I



Phone Number

This option specifies the phone number for the ECG transmission destination (another unit or an E-SCRIBE system). Enter up to 40 characters. Special characters may be added using the ALT - key combinations, listed below. Use the **BACKSPACE** key to erase an entry error.

ALT-Key	Character	ELI Display
1	!	
2	@	
3	#	
4	$	
5	%	
6	^	
7	&	
8	*	
9	(	
0	)	
A	~	right arrow
B	\	Japanese Yen
C	,	
D	-	
E	=	
I	{	
K	[	
L	]	
M	<	
N	>	
O	}	
P	+	
Q	?	
R	"	
S	/	
T	'	
U	;	
V	`	
W	|	
X	.	
Y	:	

To insert a pause for an additional dial tone, use the letter **W**. For example, you may need to dial a **9** to get an outside line.

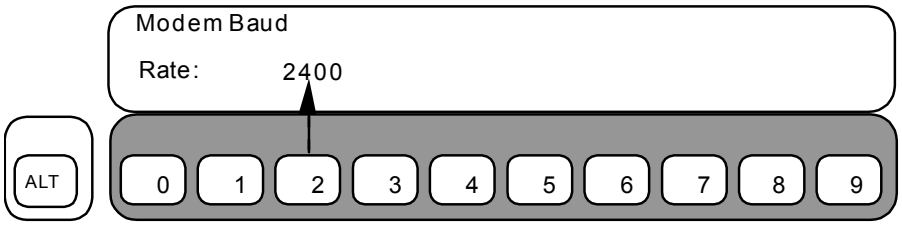
EXAMPLE: 9**W**14145554321

To change tone dialing to pulse dialing, use the letter **P**.

EXAMPLE: **P**14145554321

(If necessary, you can use both the letter W and the letter P in the same phone number.)

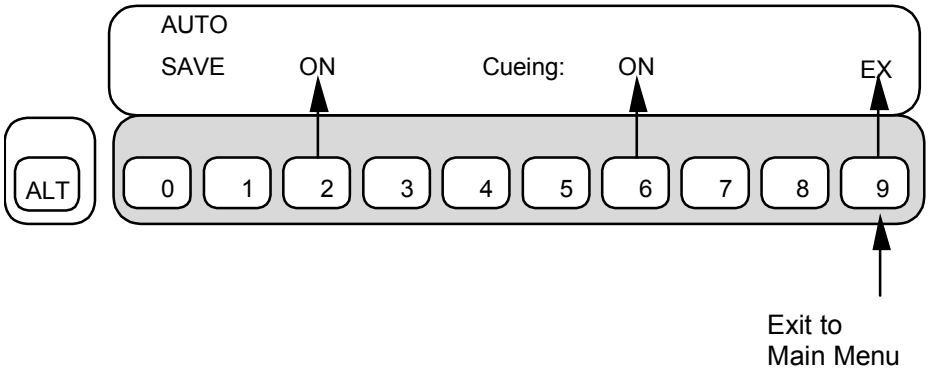
Protected Configuration Screen J



Internal Modem Baud Rate

The default setting for this option is 2400 bps for telephone transmission. It is recommended that the 2400 default setting be used at all times. If you find that you are having frequent transmit (XMT) failures due to poor telephone line quality, press the 2 softkey to change the baud rate to 1100.

Protected Configuration Screen K



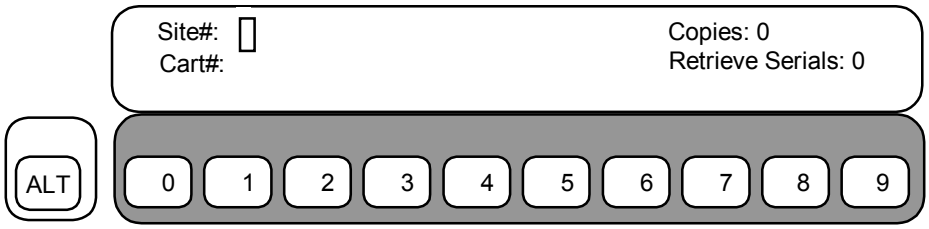
Auto Save

This option defines whether or not the ELI 100 is to save all newly acquired ECGs in the directory. If the selected configuration option is set to OFF, the ELI 100 asks if you wish to save each new ECG after it prints. A "YES" answer saves the ECG in the directory.

Cueing

The ELI 100 contains an optical sensor in the writer that aligns a black rectangle on the back of the thermal paper with a predetermined starting point for printing. If the Cueing option is ON, every 12-lead ECG printout stays within the perforation lines, which are placed every 11 inches. If the Cueing option is OFF, each printout begins directly after the preceding printout regardless of the location of the perforation lines.

Protected Configuration Screen L



Site Number

Read only Display. This option identifies the site of your ELI 100. Site numbers designate the hospital, clinic, or institution for ECG records stored in a Mortara Instrument, Inc., E-SCRIBE system and must be defined for transmitting. You can use up to four digits for the site number; numbers from 0 to 9999 are supported. See Persistent Configuration for details to edit site number.

Cart Number

Read only Display. Cart numbers indicate which electrocardiograph transmitted a particular ECG. You can use up to four digits for the cart number; numbers from 0 to 9999 are supported. See Persistent Configuration for details to edit cart number.

Copies

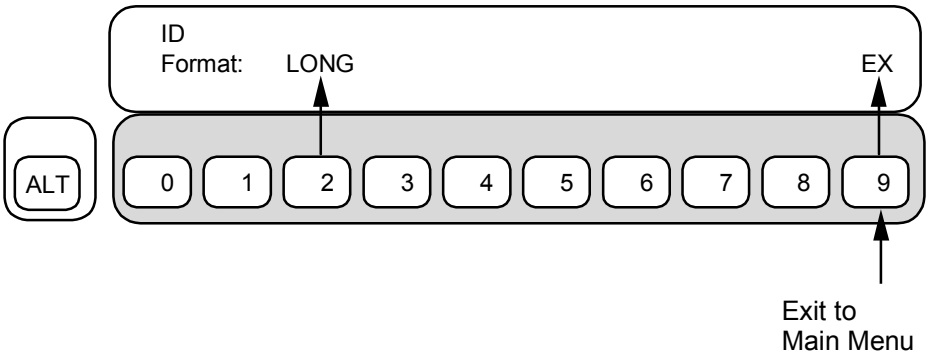
This option defines the number of printed copies when an ECG is taken. A zero (0) setting prints the original only; one (1) prints the original plus 1 copy; two (2) prints the original plus 2 or more copies (up to 9 copies).

You can request copies from the ECG Activity screen, which appears after ECG acquisition. You also can request copies while in the directory from the Directory Maintenance screen.

Retrieve Serials

This value should always be set to 0.

Protected Configuration Screen M



ID Format

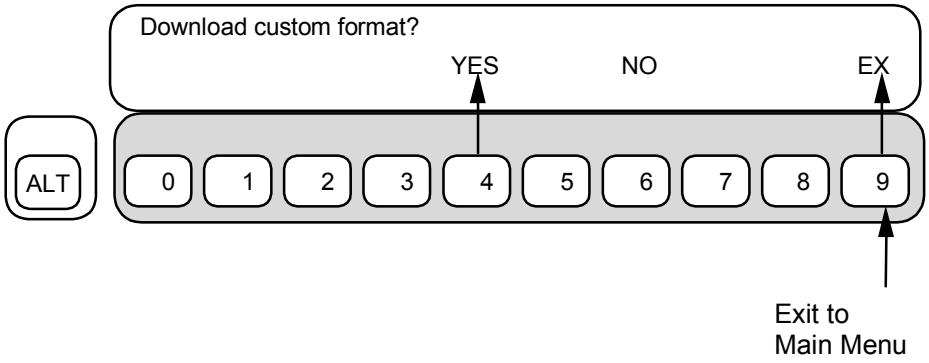
This option defines the format for the patient ID information prompts. There are four available formats: SHORT, STD, LONG, or CUSTOM.

The SHORT format includes the patient's last name, patient ID number, age, and sex prompts.

The STANDARD format includes the patient's last name, patient ID number, age, height, weight, sex, race, medication 1 selection, medication 2 selection, and the Location field.

The LONG format is identical to the STD format except that it includes the patient's first name, room and comment fields.

The CUSTOM format, which is designed in the E-SCRIBE system, can be downloaded to the ELI 100. When you select the CUSTOM format and press the **ENTER** key, the following screen appears.

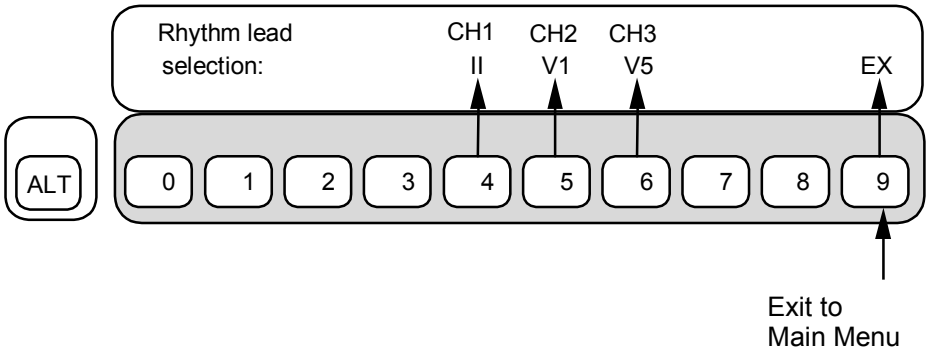


Before you download the CUSTOM format, set up the defined configuration for ECG transmission (either a direct hookup or a telephone connection). Press **YES** to receive the customized ID format, and connect the electrocardiograph accordingly.

When the download completes, the CUSTOM format becomes the ID menu format for all future ECGs until you reconfigure the ID format. If you reset the format option to SHORT, STD, or LONG, and then wish to change back to an original or a new CUSTOM format, you must repeat the download process.

NOTE: Also see Initial Configuration section to download custom ID.

Protected Configuration Screen N



Rhythm Lead Selection

This option defines the programmable rhythm strip selections for 3-channel rhythm strips. Using the 4, 5, and 6 soft keys, you can toggle through each of the 12 leads to select the entries for the three channels.

The factory-set default values are:

Channel 1: Lead II

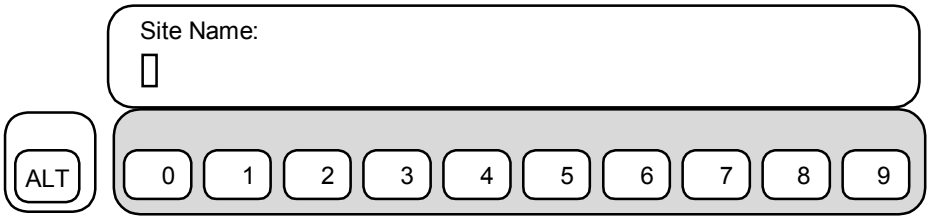
Channel 2: V1

Channel 3: V5

You can also print the standard lead groups (I-II-III, aVR-aVL-aVF, V1-V2-V3, V4-V5-V6), and the Frontal group in a 6-channel format (I-II-III-aVR-aVL-aVF)**,** and a Precordial group in a 6-channel format (V1-V2-V3-V4-V5-V6) by toggling the **GRP** key on the Rhythm Activity screen while the rhythm strips are printing.

NOTE: You can print a 12-channel format by pressing RHY in the special functions menu. (See Section 5.)

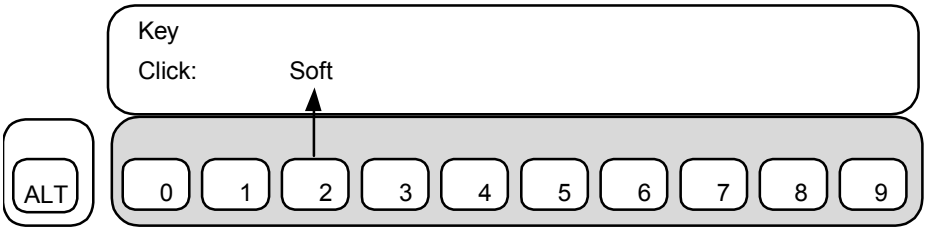
Protected Configuration Screen O



Site Name

This option defines your clinic, hospital, or office name. You can enter up to 32 alphanumeric characters. The site name prints just left of center at the bottom of the ECG printout.

Protected Configuration Screen P



Key Click Volume Setting

This option defines the data entry click loudness. Press the soft key (2) to toggle through and select soft, medium or loud.

EXTERNAL MODEM

The external modem initialization string is accessed by selecting **ALT + SPF** from the main menu and then **ALT + I**. The modem command sequence can be entered and shall allow the user to enter special characters required by some modem commands. These special characters can be entered using the ALT key in combination with the following keys:

ALT-Key	Character	ELI Display
1	!	
2	@	
3	#	
4	$	
5	%	
6	^	
7	&	
8	*	
9	(	
0	)	
A	~	right arrow
B	\	Japanese Yen
C	,	
D	-	
E	=	
I	{	
K	[	
L	]	
M	<	
N	>	
O	}	
P	+	
Q	?	
R	"	
S	/	
T	'	
U	;	
V	`	
W	|	
X	.	
Y	:	

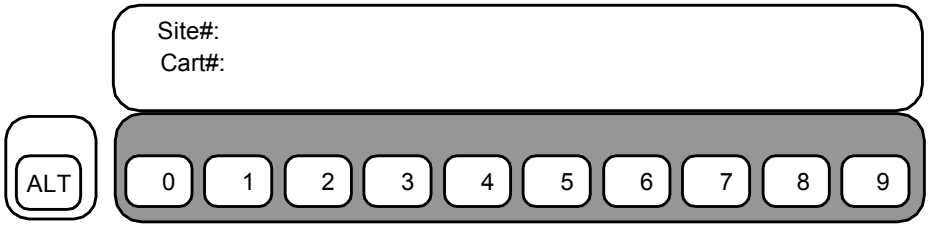
Before using your modem, you must configure it for country-specific operation. This is also true if you move the modem to a different country after it has been configured for country-specific operation. The following list of countries require "%T19,0,XX" to be added to the modem initialization string. Where “XX” is replaced by the number in the following table. The "%T19,0,XX" should be removed for all other countries.

%T19, 0, XX

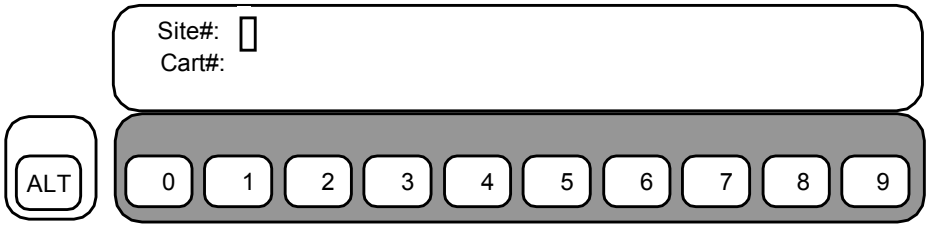
Country	XX
Australia	01
Czech Republic	25
Hong Kong	30
Hungary	30
India	30
Indonesia	30
Japan	10
Korea	30
New Zealand	09
Philippines	30
Poland	30
Singapore	30
South Africa	35
Slovenia	30

Persistent Configuration

The persistent configuration menu allows the user to define the site number and the cart number.
Begin from the Initial Configuration menu (ALT+SPF from the main screen).
Select ALT + D, to display the current site number and cart number.



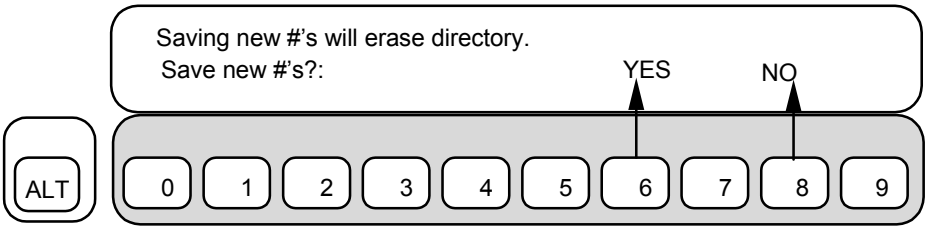
Select ALT + P, to program the new site number and/or cart number.



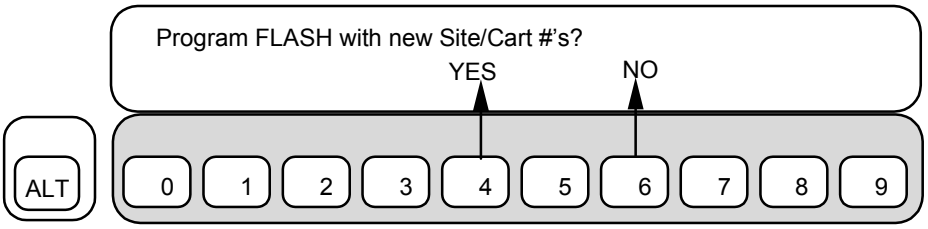
You may enter up to four digits for the site and cart numbers; numbers from 0 to 9999 are supported.

NOTE: When site # and cart # are left blank and the ecg is printed from memory, the value for site # and cart # will be 0 on the printout.

After the new numbers are entered, the user will have the option of saving them to FLASH memory.

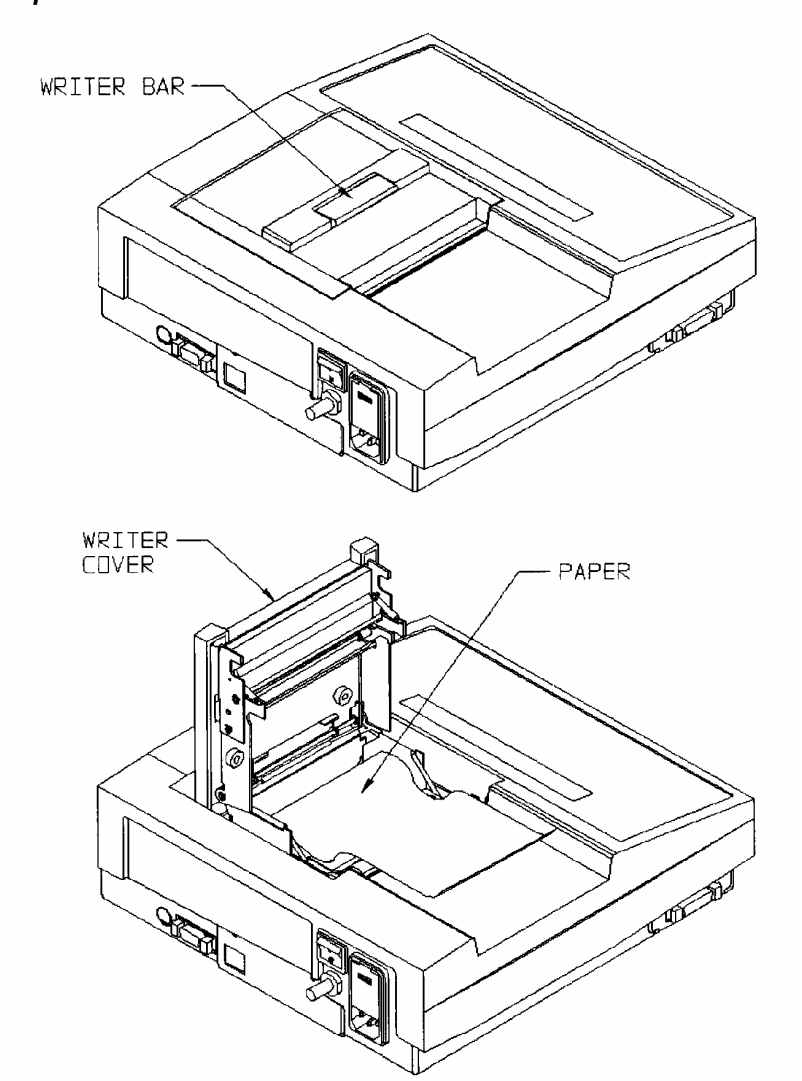


If you choose to save the newly programmed site and cart numbers, the following message appears:



Load Thermal Paper

Paper Installation Procedure



To open the writer, push the writer bar to the right. This releases a latch, which makes an audible click. Once released, pull up and back on the bar to open the writer cover.

To install paper:

❶ ***Insert a four-inch roll of thermal paper into the writer trough, as pictorially represented on the inside of the writer.***

NOTE: Be sure to install the paper grid side up.

❷ Grasp the leading edge of the paper roll and pull out the paper approximately four inches beyond the closure point of the writer.

To close, gently lower the writer cover until it stops. Then press down on the writer bar to latch the cover.

To cut paper, grasp the lower edge of the paper and pull up along the printhead. The printhead acts as the cutting edge.

NOTE: Only latch the writer cover by pressing down on the writer bar. Pressure on any other parts of the writer may damage the writer.

NOTE: Use of paper other than approved by Mortara Instrument, Inc. may damage the writer mechanism or produce printouts of undesirable quality.

Apply Power

To apply power to the electrocardiograph unit:

❶ Plug the power cord into an AC wall outlet and into the back of the ELI 100.

❷ Flip up the **I/0** power switch, to the **I** position (flat to the side of the unit). The I/0 power switch can and should remain in the I position **at all times.**

When you turn on the power switch, the word AC POWER (or CHARGING if the batteries are low) appears on the LCD (liquid crystal display) screen. After eight hours of charging without operation, the internal battery will be fully charged.

ELI 100 Supply List

Standard ELI 100 orders include the following accessories:

- P/N 9293-021-50/51 Resting Patient Cable (Domestic/International)
- P/N 3181-008 / -002 Hospital Grade Power Cord (Domestic/International)
- P/N 9100-004-01 ELI 100 Paper - 4 Rolls
- P/N 9300-032-50 Monitoring Electrodes
- P/N 9281-002-50 Snap Adaptors
- P/N 9502-057-50 ELI 100 Operator's Manual
- P/N 9503-038-01 ELI 100 Short Form Instruction Card

To order additional supplies, contact a Mortara Instrument customer service representative at:

Mortara Instrument, Inc.
7865 N. 86th Street
Milwaukee, WI 53224
Phone: 888-MORTARA
(414) 354-1600
Fax: (414) 354-4760
Internet: *http://www.mortara.com*

2 Operation

Starting the System

Operation

The ELI 100 operates on AC power or an internal, rechargeable battery.

AC Power Operation

To operate using AC power:

❶ Plug the AC power cord (use hospital grade) into the left rear receptacle of the ELI 100.

❷ Depress the I on the I/0 power switch located on the left rear of the ELI 100.

❸ The words AC POWER appear on the LCD screen.

If the batteries need charging, the word CHARGING is displayed on the LCD screen.

The internal batteries are fully charged after eight hours of charging without use of the ELI 100.

Battery Operation

When fully charged, the ELI 100 can operate on batteries for approximately 4 hours.

To operate using battery power:

❶ Flip up the **I/0** power switch, located on the left side of the unit, to the **I** position (flat to the side of the unit). The I/0 power switch can and should remain in the **I** position **at all times.**

❷ Press the **ON/OFF/DC** key located on the left side of the keyboard.

The words SELF TEST appear briefly on the LCD screen followed by the Main Menu screen.

If the batteries are not charged adequately, the message BATTERY LOW appears on the LCD screen.

If the battery fuse is not installed correctly or is not functioning, a blank screen is displayed on the ELI 100. See Section 6, “Troubleshooting.”

WARNING: ***The ELI 100 will automatically turn off (blank screen) if the batteries have been severely discharged.***

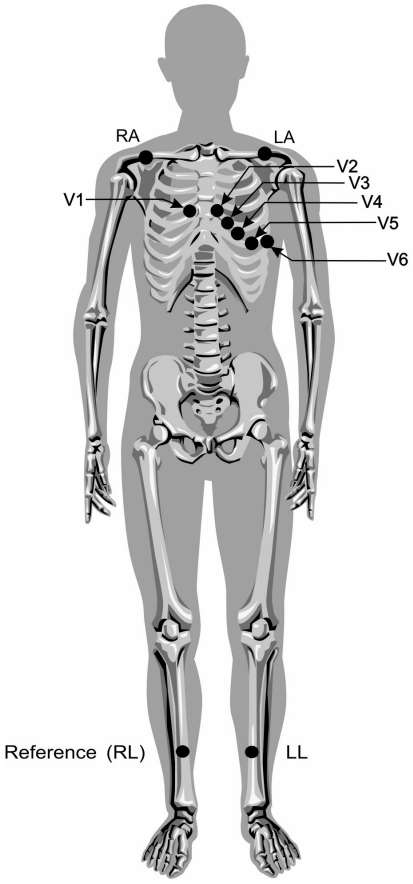
NOTE: ***If no keys are pressed for about four minutes, the ELI 100 turns itself off to conserve battery power. The only exception to this operation is when the user prints a continuous rhythm strip or if the AC power is on. (If no keys are pressed for about one minute from the main menu, the Eli 100 will turn off).***

WARNING: ***After operating the ELI 100 using battery power, always reconnect the power cord and depress the I on the I/O power switch. This ensures that the batteries will be recharged for the next time you use the ELI 100. The word CHARGING or AC Power will appear on the LCD screen.***

Patient Preparation

Correct electrode placement is important for acquiring a successful ECG (see *Patient Hookup* below). Consider performing some patient preparation procedures to remove oils, lotions, and hair from the skin, particularly on obese individuals.

Patient Hookup



IEC CHANNEL DESIGNATIONS	AAMI CHANNEL DESIGNATIONS
C1	V1
C2	V2
C3	V3
C4	V4
C5	V5
C6	V6
R	RA
L	LA
N	RL
F	LL

ID Menu Formatting

The ELI 100 provides four possible formats (LONG, SHORT, STANDARD, or CUSTOM) for entering patient identification information.

Selecting the ID Menu

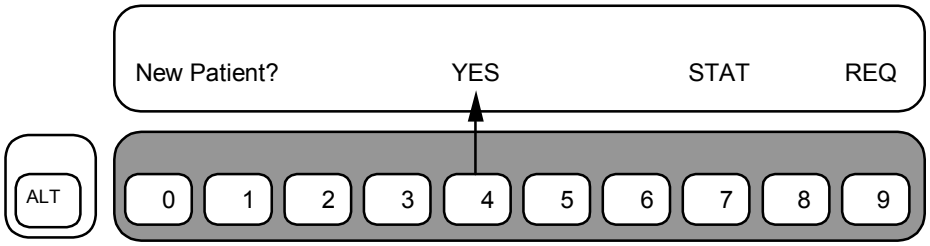
You should enter patient identification information for each patient at the beginning of a session.

To access the ID data entry menu:

- Press the **ID** key (9) on the Main Menu.

  OR

- Press either the **ECG** (electrocardiogram) or **RHY** (rhythm strip) function key and answer YES to the "New Patient?" question that follows.



NOTE: If the patient is connected to the electrocardiograph and you press the ECG or RHY key, the ELI 100 automatically begins the 10-second ECG acquisition while you are entering the patient's identification data. Therefore, you should instruct the patient to relax in a recumbent position to ensure that the ECG is free from noise and artifact due to patient activity.

If you press the ID key from the Main Menu to enter new patient information, the entered information is stored in memory. After completing the ID menu sequence and returning to the Main Menu, you must press the ECG or RHY function key to run an ECG or rhythm strip.

ID Menu Prompts

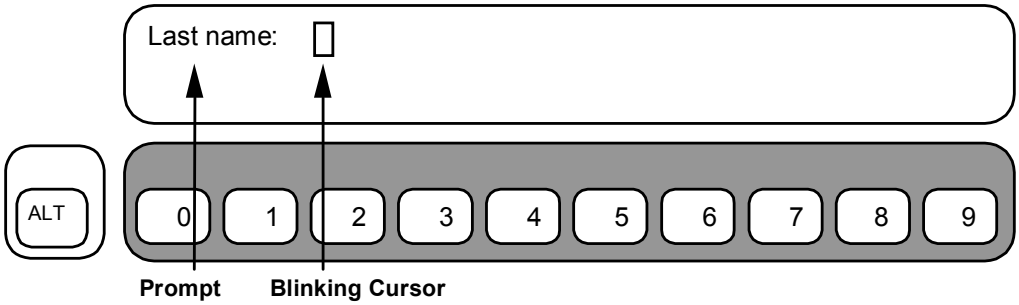
Depending on the ID format configured at setup, a series of LCD prompts tells you what patient information to enter. After you type in the requested data and press the **ENTER** key, the blinking cursor moves sequentially to the next data entry field. Regardless of the ID format selected in the protected configuration, the patient ID field can be entered with upper case alphanumeric characters.

NOTE: Site number may be pre-appended to the patient ID depending on the protected configuration setting.

You should always complete the Name and Patient ID Number fields. For units with interpretive software, it is necessary to enter the patient's age and sex for an accurate reading. To skip other data entry fields, do not type in any information in the field and press the **ENTER** key. Skipped fields appear as a blank field on the ECG report.

NOTE: If date of birth field is used in a custom ID format, the entry of the date of birth will automatically calculate patient's age. The date format can be configured for US or European format.

Sample ID Screen Prompt



ID Menu Sequence, Long Format

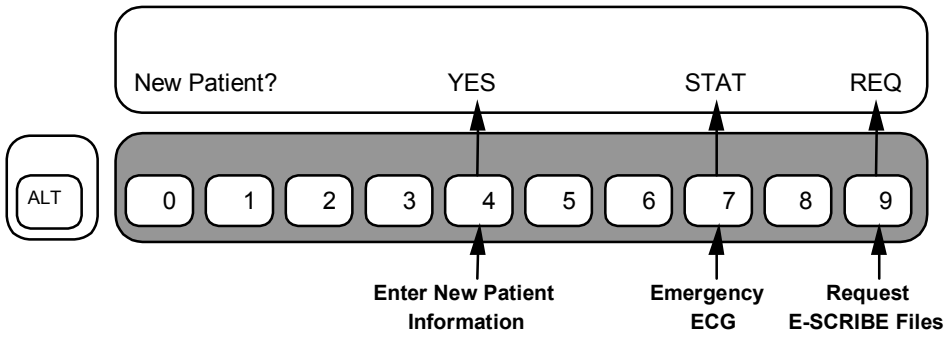
Screen Prompts	Data Entry Instructions
Last name:	Type the patient's last name (up to 20 characters). Press **ENTER**.
First name:	Type the patient's first name (up to 10 characters). Press **ENTER**.
Patient ID:	Type the patient's identification number (up to 12 digits) using the numeric keys. Press **ENTER**.
Age: Ht: Wt: Sex:	Type patient's age (up to 3 digits). Press **ENTER**. Type patient's height using inches or centimeters (up to 3 digits). Press **ENTER**. Type patient's weight in pounds or kilograms (up to 3 digits). Press **ENTER**. Type the letter “M” for male or "F" for female OR press the forward and backward arrows (soft keys 8 and 9) to enter male or female. If you do not make a selection, the entry defaults to male. Press ENTER.
Race:	Type the first letter of the patient's race: C = Caucasian B = Black H = Hispanic O = Oriental OR press the forward or backward arrows (soft keys 8 and 9) to scroll the list for a selection. A "blank" selection is provided for unknown race. Stop at the race you want to select and press **ENTER**.

ID Menu Sequence, Long Format, Continued

Medication 1:	Press the forward or backward arrows (soft keys 8 and 9) to scroll the list of 10 groups for a selection: Blank (no entry) Digitalis Beta Blocker Quinidine/Norpace Diuretic Calcium Antagonist Proc/Lido/Tocainide Other Antiarrhythmic Psychotropic Unknown Stop at the medication you want to select and press **ENTER**.
Medication 2:	Repeat instructions for Medication 1. Press **ENTER**.
Location:	You can use this field to enter the patient's room number or any other user-defined information (up to 5 alphanumeric characters). Press **ENTER**.
Room:	Use this field to enter the patient's room number (up to 5 alphanumeric characters). Press **ENTER**.
Comment:	Use this field to further identify a room number, list patient symptoms, or add any other user-defined information (up to 20 character spaces). Press **ENTER**.

3 Acquiring and Printing a 12-Lead ECG

ECG Selection Screen Description



The ECG Selection screen appears if you press the **ECG** function key before entering patient identification information on the ID menu.

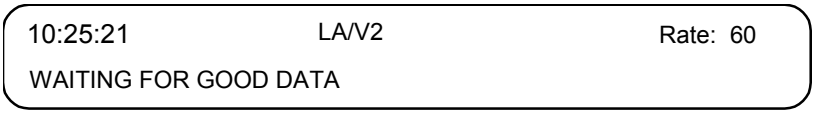
The **YES** key (4) allows you to access the ID data entry menu to add new patient information.

The **STAT** key (7) allows you to acquire an emergency ECG. You can add the patient's identification information later by editing the ID fields from the ECG directory. See *Section 5* for instructions on using the ECG directory.

The **REQ** key (9) enables you to select a patient from the E-SCRIBE request list. The list may contain all the patient's ID information, which you can add to an ECG.

You should begin routine ECGs by connecting the patient to the ELI 100 and entering the patient identification information as described in *Section 2*. After you complete the last data entry field on the ID menu and press the **ENTER** key, the LCD screen displays the following status condition:

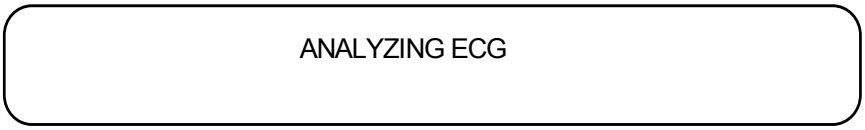
If the patient has been connected correctly for 10 seconds, the “Acquiring ECG” message is displayed only momentarily.
If there is excessive noise or lead(s) failure during the acquisition of the ECG, the following screen appears:



The top line of the LCD screen shows the lead or leads that are not properly attached or that are not sending clear data. The screen display sample "LA/V2" identifies a lead fail of the left arm (LA) and V2 chest lead. When the problem is corrected, the ELI 100 waits for 10 seconds of good data before analyzing the ECG. If you cannot correct the problem, you can override the message by pressing the **ECG** key a second time.

ECG Analysis

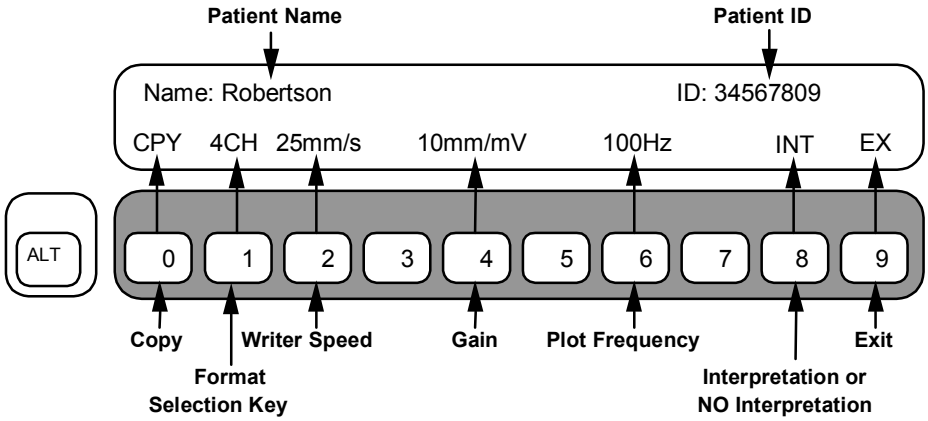
The ELI 100 analyzes the ECG in approximately three seconds. The LCD screen briefly displays the following status condition:



The writer then prints an 8 1/2" by 11" strip that graphs the 12-lead ECG data in the format selected at setup. See *Appendix B* for descriptions and illustrations of the ECG print formats.

If the Auto Save screen is set to **OFF**, the system displays this screen after printing the ECG. Press **YES** (4) to save the ECG and store it in the system's memory. If you press **NO** (6), the ECG will not be saved and stored.

ECG Activity Screen Description



The ECG Activity screen appears after the writer prints the ECG data. On this screen you can change the writer speed, gain, plot frequency, and the interpretation option. You also can print copies of the ECG report in any of the available plot formats or print the Measurement Matrix. To select the printing format parameters, toggle the **Format Selection (1)** key.

Format Option	ECG Data
STD (Standard)	2.5-second graph of 12 leads in a 3-channel format
4CH	Condensed graph of 12 leads in a 4-channel format (3 channels contain a labeled median complex; 4th channel is a 10-second rhythm strip of Lead II)
2PG (Two Page)	Standard format PLUS a 3-channel 10-second strip of each Leads V1, II, V5

The **CPY** key (0) allows you to make an additional copy of the ECG report. Select the printing format instructions for each copy before you press the **CPY** key.

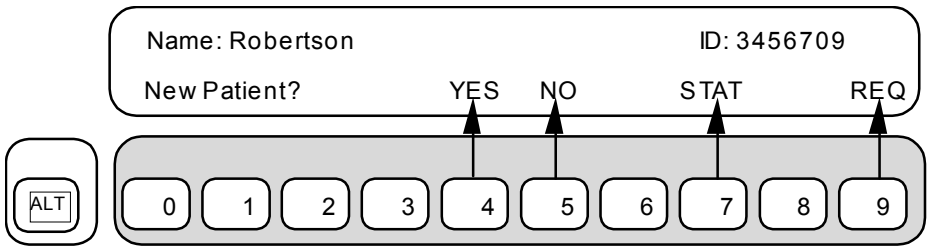
The **Format Selection** key (1) allows you to select the copy format.

The **INT/NO INT** key (8) allows you to copy an ECG with the interpretation (INT) printout or without the interpretation printout (NO INT).

The **EX** key (9) returns you to the Main Menu and deletes the ECG if it was not saved.

Taking a Second ECG

If you need to take a second electrocardiogram on the same patient after the first one has printed, press the **EX** (exit) key to access the Main Menu. Then press the **ECG** function key. The LCD displays the following screen:



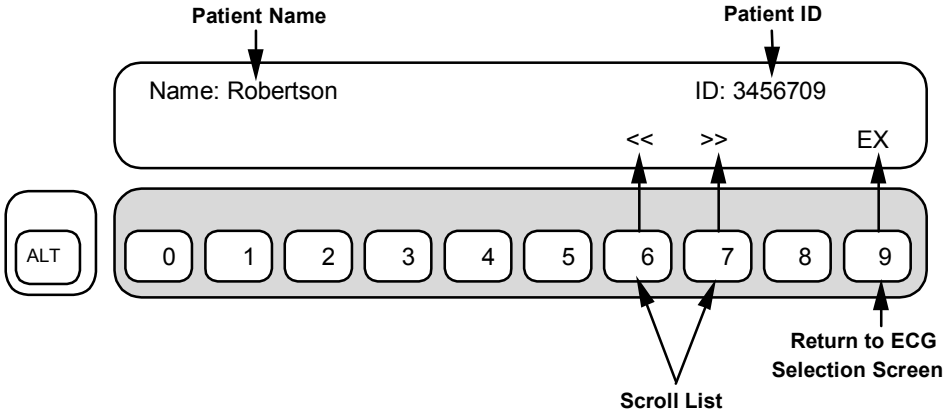
Since the patient's ID information is stored in memory, you can acquire another ECG by answering NO (soft key 5) to the "New Patient?" question. The other keys, **STAT**, **REQ**, and **YES** perform the same functions as described for the main ECG Selection screen.

Selecting an E-SCRIBE Patient File

The Request Selection screen (on the next page) appears when you select the **REQ** function. The top line of the LCD displays the name and ID of each patient on file

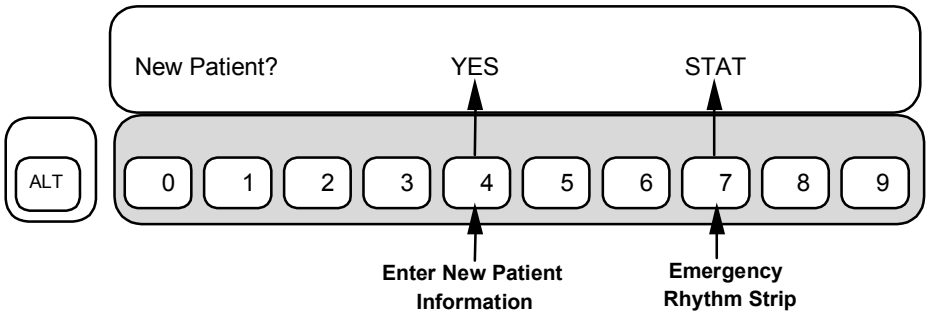
- To scroll through the list of patients, use the **<< (6)** (previous) and **>> (7)** (next) keys or access the patient data with the keyboard by entering the first letter of the last name. If there is more than one patient with the same initial, continue to enter the first letter until the appropriate patient name and ID appear
- Stop at the patient ID you want to select.
- To add the patient information contained on the request list to an ECG, connect the patient to the ELI 100 and press the **ECG** function key on the keyboard.
- To continue selecting patient IDs from the request list, you must access the ECG Selection screen from the Main Menu for each new patient.

Request Selection Screen



4 Acquiring and Printing a Rhythm Strip

Rhythm Selection Screen Description



The Rhythm Selection screen appears if you press the **RHY** function key before entering patient identification information on the ID menu.

The **YES** key (4) allows you to access the ID data entry menu to add new patient information.

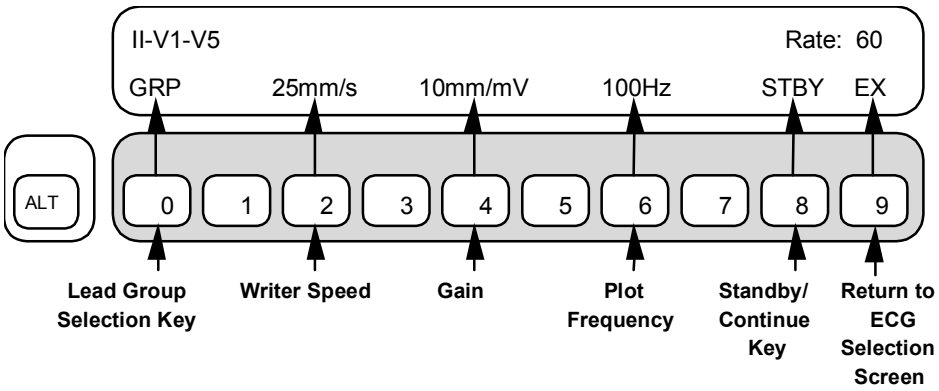
The **STAT** key (7) allows you to print a rhythm strip immediately and bypass the entry of patient ID

Acquiring Routine Rhythm Strips

You should begin routine rhythm strips by connecting the patient to the ELI 100 and entering the patient identification information as described in *Section 2*. After you complete the last data entry field on the ID menu and press the **ENTER** key, the rhythm strip begins printing.

See *Appendix B* for a description and illustration of the rhythm print format.

Rhythm Activity Screen Description



The Rhythm Activity screen appears as soon as the writer begins printing the 3-channel rhythm strip. You can change the lead groups and printing parameters during printing by pressing the corresponding soft keys.

The **GRP** key (0) selects a new lead group. The available groups are:

)

LEAD GROUP	DESCRIPTION
I, II, III	3-channel format
aVR, aVL, aVF	3-channel format
V1, V2, V3	3-channel format
V4, V5, V6	3-channel format
Frontal	6-channel format: I, II, III, aVR, aVL, AVF
Precordial	6-channel format: V1, V2, V3, V4, V5, V6

The **Writer Speed** key (2) changes paper speed options (25 mm/s, 50 mm/s, 5 mm/s, 10 mm/s).

The **Gain** key (4) changes complex size options (10 mm/mV, 20 mm/mV, 5 mm/mV).

The **Plot Frequency** key (6) toggles between 100 Hz and 40 Hz.

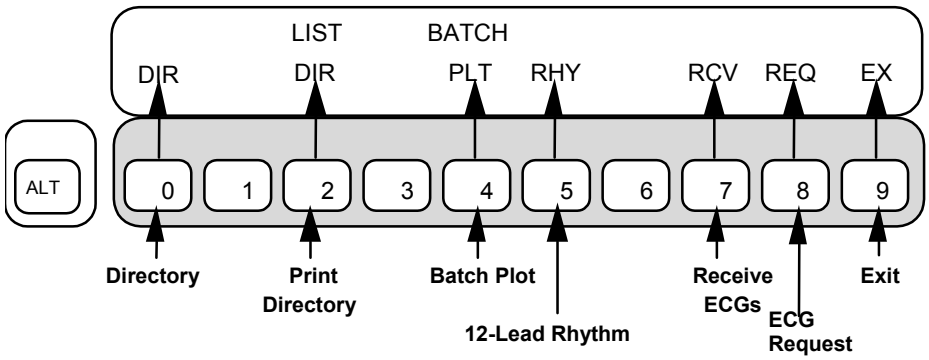
You can place the writer in a **STBY** (standby) mode by pressing key 8. You can also change lead groups, writer speen, gain and plot frequency while in this mode. To continue printing, press key 8 (**CONT**) again.

To stop the writer and return to the Main Menu, press the **STOP** key.

5 Using the Special Functions

The special functions are additional ELI 100 programs that enable you to locate and print ECGs stored in memory, send and receive ECGs to and from other locations, batch plot ECGs, and perform directory maintenance. To access the Special Function screen, press the **SPF** key on the Main Menu.

Special Function Screen Description



The **DIR** key (0) allows you to access the patient directory.

The **LIST DIR** key (2) prints a list of all ECGs contained in the directory.

The **BATCH PLT** key (4) allows you to batch plot all unplotted ECGs from the directory.

The **RHY** key (5) allows printing of a 12-channel format rhythm strip.

The **RCV** key (7) allows you to receive ECGs from another electrocardiograph.

The **REQ** key (8) enables you to download requests from E-SCRIBE.

The **EX** key (9) returns you to the Main Menu.

Directory Description

The directory contains all the saved ECGs, and it can store approximately 75 ECGs depending on the storage space required for individual records. (Storage capacity increases to approximately 300 ECGs with the serial comparison and memory upgrade option.) The heart rate, format, and signal quality determine how much memory it takes to store each record.

An ECG may be listed in the directory but have a "deleted" status. The directory keeps deleted ECGs in the event that you may want to recover an ECG at some later time. However, the ELI 100 will write over a deleted ECG if the directory is full.

If the directory is full and there are no deleted ECGs, the following message appears on the LCD:

UNABLE TO STORE ECG

You cannot save a new ECG until you either delete or erase a non-deleted ECG.

Printing a Directory

To print a hard copy of a directory, press the **LIST DIR** key on the Special Function screen. The writer produces a printout similar to the illustration below.

Patient Directory

Name	Patient ID	Date	Time	PLT	XMT	RTV	DEL
		05/12/90	09:03:53				
		05/10/90	10:29:13				
Adams	465238	05/09/90	19:33:01	X			
	465238	05/10/90	10:48:44				X
	465238	05/10/90	10:49:25				
Davis	774021	05/12/90	09:01:30				
	774021	05/11/90	12:48:12				
deConstanza	224313	05/11/90	12:03:05				
Green	334212	05/12/90	16:05:37				
	334212	05/11/90	11:35:35				
Schmidt	998742	05/10/90	12:30:56				
Tolstoy	001742	05/13/90	09:20:19				
	001742	05/13/90	09:16:41				X
	001742	05/12/90	16:48:00				
Wallinski	574391	05/12/90	15:56:29				
	574391	05/12/90	11:03:47				

The directory lists stored ECGs in alphabetical order using the patients' last names. If multiple ECGs are stored for one patient, the last name is printed for only the first ECG. ECGs with identical patient ID numbers are grouped together. ECGs acquired using the STAT key are placed at the top of the directory, and a blank last name field indicates that the patient's last name was not entered.

The printout also marks ECGs (with an “X” in the appropriate column) to indicate if they have been plotted (PLT), transmitted (XMT), retrieved (RTV), or deleted (DEL). An ECG is marked as plotted only if it was plotted after being recalled from the directory or if it was batch plotted. An ECG that is acquired and printed in the normal process is not marked as being plotted. Only confirmed ECGs retrieved from an E-SCRIBE system will be marked with an "x" in the retrieved (RTV) column.

NOTE: ***A question mark appearing in front of a listed ECG indicates corrupt data. A printout of this ECG may show different wave forms than the original ECG, or it may cause a reset of the electrocardiograph configuration and directory. If a reset occurs, the ELI 100 displays an error message indicating that you must reconfigure the setup parameters. If this occurs, contact your Mortara Service Representative for assistance.***

Directory Screen Sequence

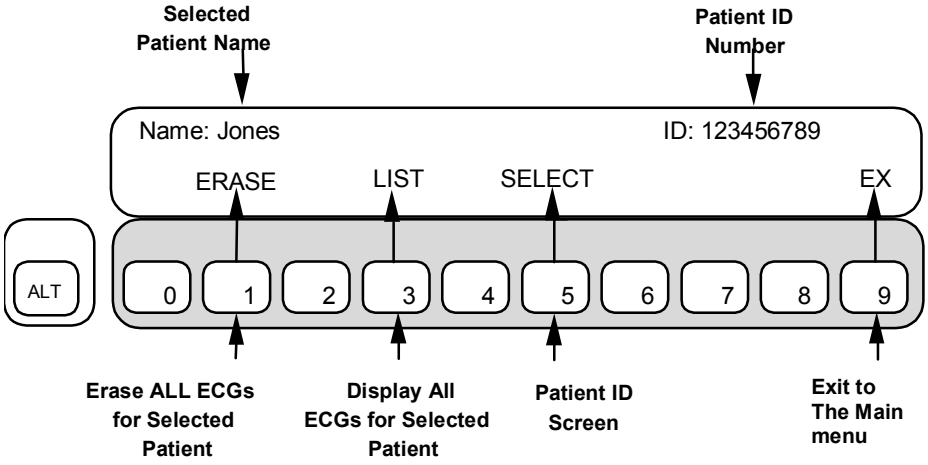
You locate ECGs in the directory by entering the first letter of the patient's last name. To access the first level of the directory, press the **DIR** (directory) key on the Special Function screen. The LCD screen then displays the Patient Selection screen. From this screen you can identify a specific patient and erase or list all of that patient's ECGs. Additionally, you can identify one specific ECG for the selected patient, press the **SELECT** key, and advance to the Directory Maintenance screen where you can edit, erase, transmit, delete, or copy that specific ECG.

Screen Sequence	Directory Options
Special Function Screen	**DIR** key: Advances you to the Patient Selection screen. **LIST DIR** key: Prints a list of all ECGs in the directory.
Patient Selection Screen	Select a patient: Type in the first letter of the patient's last name. **ERASE** key: Permanently removes all ECGs for the selected patient. **LIST** key: Prints a list of all the ECGs for the selected patient. **SELECT** key: Advances you to the Patient ID screen where you can select a specific ECG for the selected patient. **EX** key: Returns you to the Special Function screen.
Patient ID Screen	**<<** and **>>** keys: Allow you to scroll backward and forward through the ECGs to select a specific ECG. **ERASE** key: Permanently removes the ECG identified on the LCD screen. **SELECT** key: Advances you to the Directory Maintenance screen. **EX** key: Returns you to the Patient ID screen.
Directory Maintenance Screen	**XMT** key: Transmits the selected ECG to another unit or to an E-SCRIBE system. **DEL** key: Deletes the selected ECG record. **CPY** key: Takes you to the ECG Activity screen from which you can print a copy of the selected ECG. **RCR** key: Allows you to recover a deleted ECG. **ID** key: Allows you to view and edit the patient ID for the selected ECG. **EX** key: Returns you to the Patient ID screen.

The first patient name to appear on the Patient Selection screen depends on the most recent action that took place in the ELI 100. You will see a patient name for one of the following:

- The most recently stored patient's ECG in the directory.
- The patient's ECG which has been deleted or received since the most recently-stored ECG.
- The patient's ECG which has been transmitted to the ELI 100 from another unit.

Patient Selection Screen Description



The name displayed in the upper left-hand corner identifies the current patient name selected.

The **ERASE** key (1) allows you to permanently remove all ECGs for the displayed patient name.

The **LIST** key (3) lists all the ECGs for the displayed patient name in the same format as the directory printout (LIST DIR).

The **SELECT** key (5) allows you to select a specific ECG record (on the Patient ID screen) for the displayed patient name.

The **EX** key (9) returns you to the Special Function screen.

Selecting a Patient Name

To select a new patient name, use the keyboard to enter the first letter of the last name. If there are ECGs stored for several names beginning with the same first letter, repeat pressing the (first letter) character key to cycle through the names in alphabetical order.

To select an ECG with a blank last name field, press the **SPACE** bar.

Erasing a Patient's ECGs

To erase a patient's ECGs, select the patient's name and press the **ERASE** key. The LCD screen displays a message asking you to confirm your instruction to erase all the ECGs.

ERASE ALL – ARE YOU SURE?

Press the **YES** key (4) to erase all the selected patient's ECGs or press the **NO** key (6) to return to the Patient Selection screen.

NOTE: Erasing ECGs permanently removes the records from the ELI 100. There is no way to recover an erased ECG.

Listing a Patient's ECGs

To list all the ECGs for a specific patient, select the patient's name and press the **LIST** key. The writer produces a printout similar to the illustration below.

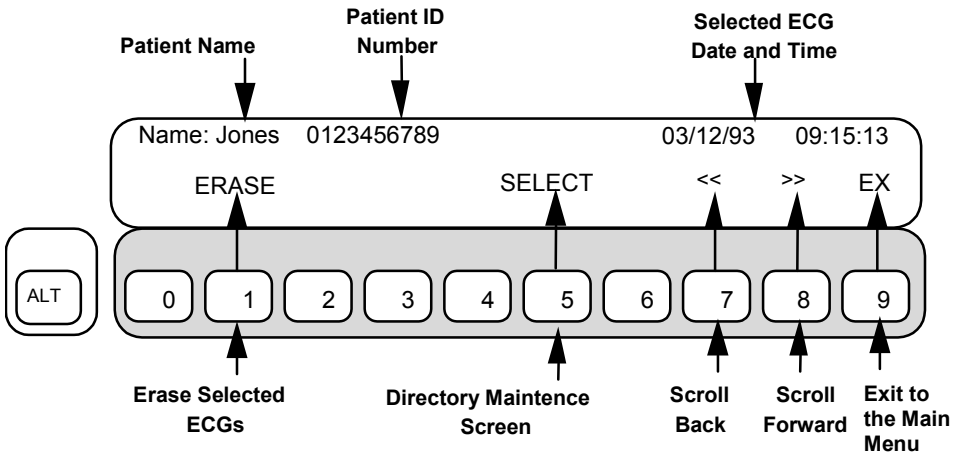
Patient Directory

Name	Patient ID	Date	Time	PLT	XMT	RTV	DEL
Adams	465238	05/09/90	19:33:02	X			
	465238	05/10/90	10:48:05				X
	465238	05/10/90	10:49:24				

Selecting a Specific ECG

To access a specific ECG record, select the patient's name and press the **SELECT** key. Pressing the SELECT key displays the Patient ID screen where you can select a specific ECG.

Patient ID Screen Description



The **ERASE** key (1) allows you to permanently remove a specific ECG.

The **SELECT** key (5) allows you to edit the patient's ID information, transmit, delete, or copy the selected ECG (on the Directory Maintenance screen).

The **<<** key (7) lets you scroll back through the patient's ECGs. When you have reached the oldest record, a circular wrap returns you to the most recent record.

The **>>** key (8) lets you scroll forward through the patient's ECGs. When you have reached the most recent record, a circular wrap returns you to the oldest record.

Erasing a Specific ECG

To erase a specific ECG record for the selected patient's name, use the << or >> keys to select the ECG that you want to erase. The LCD screen displays a message asking you to confirm your instruction to erase the ECG.

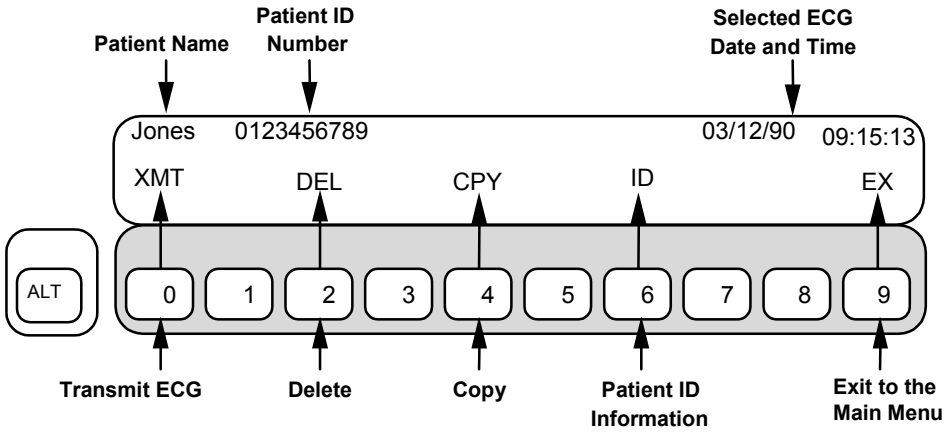
ERASE ECG – ARE YOU SURE?

Press the **YES** key (4) to erase the selected ECG or press the **NO** key (6) to return to the Patient Selection screen.

Maintenance on a Specific ECG

Use the scroll keys to select the specific ECG that you wish to edit, transmit, delete, or copy before you press the **SELECT** key.

Directory Maintenance Screen Description



The **XMT** key (0) allows you to transmit the selected ECG to another unit or to an E-SCRIBE system by direct communication or by telephone.

The **DEL** key (2) deletes the selected ECG record. The DEL key becomes the RCR key when an ECG is deleted. Press the **RCR** key to recover the previously deleted ECG.

The **CPY** key (4) returns you to the ECG Activity screen where you can print a copy of the selected ECG. See *Section 3*.

The **ID** key (6) allows you to view and edit the patient ID information for the selected ECG.

The **EX** key (9) returns you to the Patient ID screen.

NOTE: The Auto Repeat function is activated when a key is pressed for longer than one second. Since it can take up to two seconds for the delete function to process, pressing the DEL key for longer than one second will cause multiple deletes.

Updating or Adding Patient ID Information

You can edit patient identification information already entered on an ECG or add new patient information to an ECG that was acquired using the **STAT** key (emergency key). Follow the steps below:

- Press the **ID** key (on the Directory Maintenance screen) to enter new patient information or edit the existing fields for the selected ECG. See *Section 2* for a description of the ID menu.
- After you complete the ID menu and press the **ENTER** key, the Directory Maintenance screen re-appears.
- If you want a printout of the updated ECG, press the **CPY** key (4) to access the ECG Activity screen. On the ECG Activity screen, press the **CPY** key (0)

Transmitting ECGs

You can transmit ECGs between the ELI 100 and another unit or an E-SCRIBE system using a direct connection or the telephone. Before transmitting ECGs to an E-SCRIBE, the site number must be defined as well as the telephone number in the configuration program. The baud rate is set automatically.

NOTE: Telephone transmission is available with modem option only.

Direct Connection Hookup

- Connect the ELI 100 to another Mortara Instrument, Inc., electrocardiograph with a unit-to-unit cable (REF 25000-024). Plug each end of the cable into the serial ports located on the left side of the units.
- Select a baud rate of 38400 bps for both units in the configuration program. Use 38400 bps for a direct connection to E-SCRIBE.
- Turn on the respective units' appropriate transmitting and receiving options. For the receiving unit, press the **RCV** key on the Special Function screen. When the unit is ready to receive a transmission, the LCD message RECEIVE READY shows on the LCD. For the transmitting unit, select the Main Menu for a batch transmission or the Directory Maintenance screen for individual ECG transmissions.

Telephone Connection Hookup

To do the following, the modem option must be installed.

- Connect the ELI 100 to a standard telephone jack with the provided phone line cable. Plug the cable into the telephone jack located on the left side of the ELI 100 and the other end into a telephone wall jack. However, if you are using an external modem, connect the provided phone line cable to the back of the modem and connect to a standard telephone jack.
- Turn on the appropriate transmitting and receiving option for the respective units. For the receiving unit, press the **RCV** key on the Special Function screen. When the unit is ready to receive a transmission, the message RECEIVE READY shows on the LCD. For the transmitting unit, select the Main Menu for a batch transmission or the Directory Maintenance screen for an individual ECG transmission.

If the error message CONNECTION FAILURE appears on the screen, you may have entered an incorrect (or undefined) telephone number. Check the number and try again.

Sending ECGs

To batch transmit all ECGs from the ELI 100 directory, select the Main Menu and press the **XMT** function key on the right side of the keyboard.

NOTE: You cannot batch transmit deleted ECGs.

Once you have used the batch mode of transmission, you cannot batch transmit the same ECGs again. However, you can transmit the ECGs individually from the Directory Maintenance screen.

To transmit a specific ECG, identify the ECG on the Directory Maintenance screen and press the **XMT** key (0).

After you submit the transmission, the LCD screen displays the message:

CONNECTION IN PROGRESS

followed by

TRANSMIT IN PROGRESS
ID: (the number of the ECG being transmitted)

followed by

TRANSMIT COMPLETE or BATCH TRANSMIT COMPLETE

After the transmission of a specific ECG, the ELI 100 returns to the Directory Maintenance screen. After a batch transmission, the ELI 100 returns to the Main Menu.

Receiving ECGs

To receive ECGs from another electrocardiograph (using either the telephone or a direct connection), select the Special Function screen and press the **RCV** key. The LCD screen displays the following message:

RECEIVE READY

followed by

RECEIVING ECG (while transmission takes place)

followed by

RECEIVE READY (when reception is complete)

To terminate the receiving mode, press the **STOP** key. (The RCV mode terminates automatically when the directory is full.) You can access the received ECGs from the ELI 100 directory.

Batch Plotting

You can batch plot (print) ELI 100 unplotted ECGs. Press the **BATCH PLT** key on the Special Function screen. The unit automatically prints all the directory's received or retrieved unplotted ECGs.

Downloading a Request List

The ELI 100 can download and process a patient request list that identifies the ECGs needed from the E-SCRIBE system. As with the other forms of ECG data transmission, you can use either the telephone or a direct connection. Follow the hookup instructions under Transmitting ECGs in this section.

- To enter the request mode, select the Special Function screen and press the **REQ** (request) key.
- On the Request Activity screen that appears next, press the **RCV** (receive) key. The LCD screen displays the following prompt for an identification code:

> Request Identification Code:

- Type in the code defined by the E-SCRIBE system and press the **ENTER** key.

After you submit the code, LCD screen displays the message:

CONNECTION IN PROGRESS

followed by

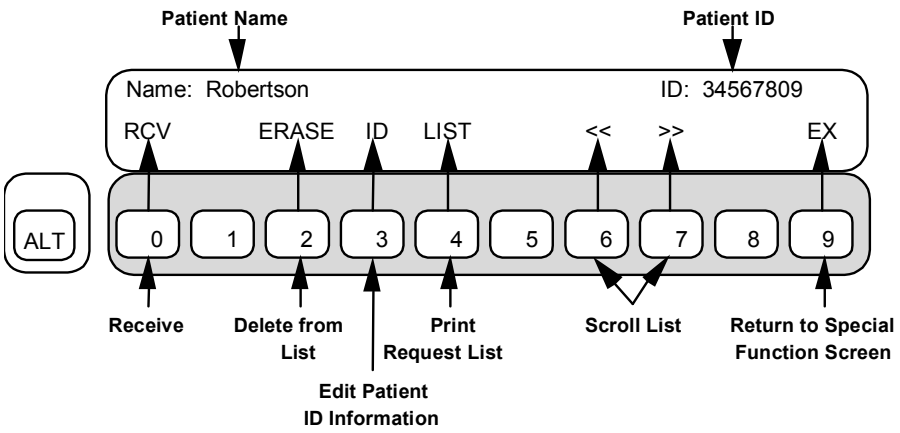
REQUEST DOWNLOAD IN PROGRESS

followed by

REQUEST DOWNLOAD COMPLETE

When the download completes, the system displays the Request Activity screen.

Request Activity Screen Description



The **RCV** key (0) brings up the identification code prompt.

The **ERASE** key (2) allows you to erase a patient from the request list.

The **ID** key (3) allows you to view and/or edit the patient identification information for the name and ID displayed on the LCD screen.

The **LIST** key (4) prints a directory of the request list.

The << and >> keys (6 and 7) allow you to scroll through the request list.

The **EX** key (9) returns you to the Special Function screen, or you can use the **STOP** key to return to the Main Menu.

The top line of the LCD screen shows the name and ID of each patient on the request list. To scroll through the list of patients, use the **<< (6)** (previous) and **>>(7)** (next) keys. You can also access the patient name by pressing the first letter of the patient's last name. If there is more than one patient with the same initial, continue to enter the first letter until the appropriate patient name and ID appear. You can perform the following functions on the displayed name and ID:

- Erase the patient from the request list by pressing the **ERASE** key.
- Edit or update patient identification information by pressing the **ID** key. The LCD screen displays the ID menu. See *Section 2* for instructions on how to enter patient ID information.

NOTE: You cannot directly enter requests on the ELI 100. To do so, you must first download requests from an E-SCRIBE.

Printing the Request List printing a request list

To print a hard copy of the request list, press the **LIST** key. You can use the printout to locate specific patient IDs. The writer produces a printout similar to the illustration below:

Request Directory

Name	Patient ID	Date	Time
Smith	198448367		
Johnson	55643010		
Adams	789665431		
Brown	224786533		
White	786553420		

Press the **STOP** key to return to the Main Menu.

6 Maintenance and Troubleshooting

Troubleshooting Chart

LCD Message	Problem	Correction
BATTERY LOW	Unable to acquire ECG.	Charge the battery with AC power.
BATTERY LOW CANNOT USE PRINTER	Unable to print.	Charge the battery with AC power.
(No message; screen is blank.)	Blank screen.	Replace the battery fuse.
CONNECTION FAILURE	Unable to transmit or receive ECGs.	Check for correct baud rate, phone number, and cable connections or site number.
CUSTOM ID DOWNLOAD FAILURE	Unable to download custom ID format from E-SCRIBE.	Check for correct baud rate, phone number, and cable connections. Insure site number and E-SCRIBE custom ID are valid (if applicable).
DIRECTORY ERROR DIRECTORY RESET CONFIGURATION ERROR	Bad configuration upon powerup. Loss of battery power.	Reconfigure parameters. Check battery fuse.
MUSCLE TREMOR	Noise.	Check on patient electrode preparation and/or patient motion.
NO ANSWER	Unable to transmit ECG.	Check for correct phone number. Insure modem and E-SCRIBE are online.
NOTHING TO PLOT	Unable to batch plot ECGs.	None. Unit will batch plot only unplotted ECGs.
RA, LA, LL, V1, V2, V3, V4, V5, V6	Lead fail.	Indication of RL/RA/LA/LL/V1/V2/V3/V4/V5/V6. Check limb leads. Correct faulty lead(s). (Continued next page)

Troubleshooting Chart, Continued

REQUEST DOWNLOAD FAILURE	Unable to download from E-SCRIBE.	Check for correct baud rate, phone number, and cable connections. Insure site number or E-SCRIBE custom ID are valid (if applicable).
TRANSMIT FAILURE	Unable to transmit ECG.	Check phone line. Insure site number is valid. Try again.
UNABLE TO STORE ECG	No available memory. ECG data too noisy to store.	Transmit or delete ECGs from the directory. Correct noise and try again.
WAITING FOR GOOD DATA	Lead fail or noisy ECG data.	Correct faulty lead or noise, or press ECG key to override message.
WRITER COVER OPEN	Unable to print.	Close writer cover and press ENTER.
WRITER OUT OF PAPER	Unable to print.	Insert paper and press ENTER.

Self-Test Printout Description

The ELI 100 produces a test pattern that charts the following printing functions:

- Writer speed
- Print density
- Writer calibration – Speed test (100mm line)
- Printhead dots
- Performing a self-test:

❶ Access the Setup screen by pressing the **ALT** key and the **SPF** key simultaneously from the Main Menu.

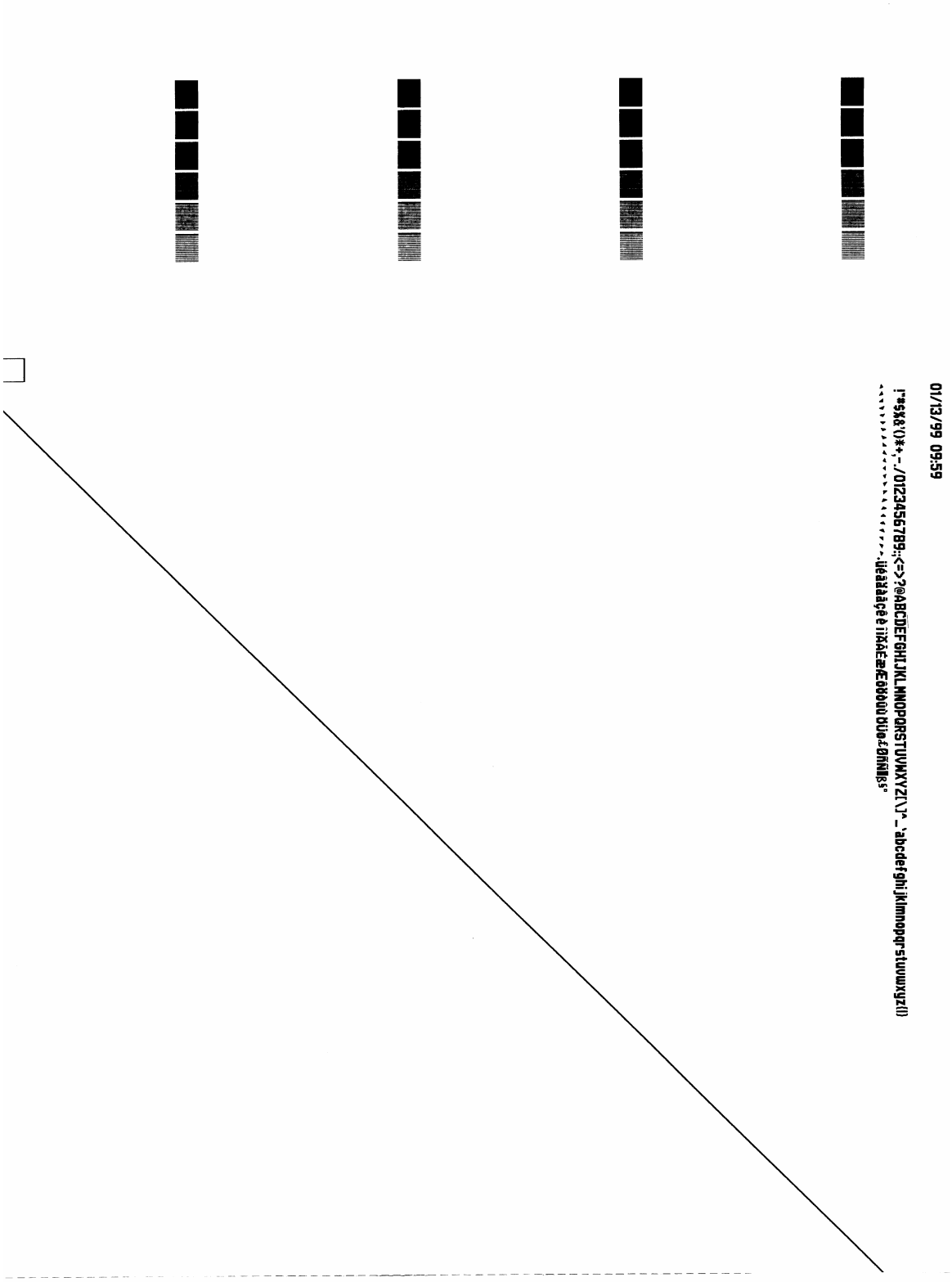
❷ On the Setup screen, press the **ALT** key and the letter "**T**" simultaneously. The LCD screen displays the following message:

SELF TEST MODE

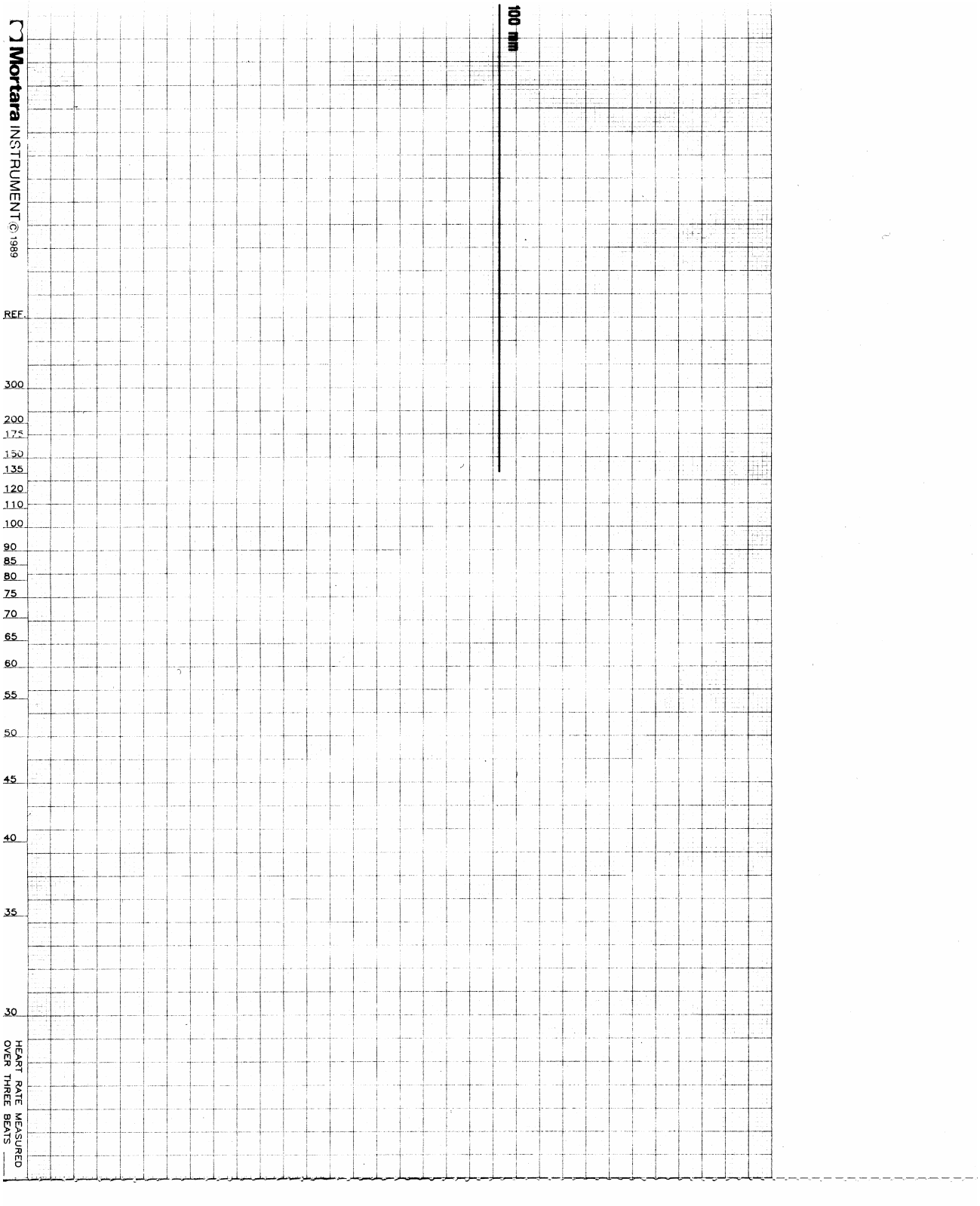
The self-test performs a "write/read" test on each memory address. After the self-test, the hexadecimal number (base 16) on the far right identifies the ending or last memory address code for the unit's random access memory (RAM). If there is an error in the memory's write or read process, the address location of the error is displayed in brackets [ ] on the screen. If this occurs, contact your Mortara Service Representative.

❸ To exit the Self-Test mode, turn the ELI 100 OFF and then back ON.

Self-Test Printout Sample, Pg. 1 of 2



Self-Test Printout Sample, Pg. 2 of 2



Cleaning and Inspection

If the hospital or institution fails to implement a satisfactory cleaning and inspection schedule for this equipment, it may result in equipment failure and health hazards.

NOTE: Only qualified service personnel should repair or replace ELI 100 parts.

Inspecting the ELI 100:

Check for the following conditions on a regular basis:

- No fraying or other damage to power cords, patient cables, or any other cables attached to the machine.
- No bent prongs or pins on the plugs and connectors.
- All cords and connectors are securely seated in their corresponding connections.
- The thermal writer paper is installed grid side up.

CAUTION: Do not attempt to clean the ELI 100 or patient cable(s) by submerging into a liquid, autoclaving, or steam cleaning.

Cleaning the ELI 100:

Disconnect the power source. Clean the exterior surface of the unit with a damp cloth using a solution of mild dishwashing detergent diluted in water. After washing, thoroughly dry off the unit with a clean, soft cloth or paper towel.

NOTE: Do not let soap or water come into contact with the writer, plugs, jacks or vents.

Cleaning the Patient Cable:

After each use, wipe off the patient cable with a damp cloth that has been immersed in a solution of light detergent, alcohol, or bleach. Make sure the cloth has been thoroughly rung out. Wipe dry immediately.

Cleaning the Writer Printhead:

Clean the printhead once a month. Open the writer lid by pressing the black button on the top of the writer to release the cover latch. Pull up on the cover from the left to open the writer cover. The printer head is the brown stripe between the two green stripes on the underside of the writer lid. Gently brush the brown stripe once or twice with an alcohol wipe. Let the printhead dry completely.

Consumable Materials:

NOTE: There are no known risks associated with the disposal of materials provided with the ELI 100.

PAPER: Paper may be disposed of as normal waste. It is not believed to be recyclable as normal paper due to its thermal characteristics. Check with your local recycling center or local authorities.

ELECTRODES: Dispose of electrodes in accordance with local regulations.

Appendix A System Information Log

The following system information log is provided for your convenience. You need this information to set up your system if it needs servicing. Be sure to update the information log when you add options or your system has been serviced.

Record the model and serial number of all components, dates of removal, and/or replacement of components, and the name of the vendor from whom the component was purchased and/or installed.

In addition to having records of this information, the system information provides a warranty record of when your system was placed in service.

System Information Log

Manufacturer:

Mortara Instrument, Inc.
7865 N. 86th St.
Milwaukee, WI 53224

Telephone Numbers:

Domestic: 800-231-7437
European: +39-51-6650-701

Sales Department: 800-231-7437
Service Department: 888-MORTARA

Product Information:

Name of Unit/Product: ELI 100

Date of Purchase: ___/___/_____

Purchased Unit From: _____

Serial Number: _____

Software Version: _____

For questions or service information when calling in, have the serial number and the reference number available. The Serial Number and Part Number (REF) are found in the following places:

Product Information

Serial Number and Ref. Number (REF)

Figure A-a Serial Number – Ref. Number label located on right side of chassis as shown.

Glossary

TERM	DEFINITION
Arrhythmia	Irregularity in the rhythm.
Augmented lead	(aVL, aVR, aVF) The difference between one site and the average of the potential of two other sites; unipolar extremity leads.
Baseline drift	The QRS complexes are present, but the baseline wanders due to poor skin/electrode contact and/or patient movement.
Bradycardia	A slow heart rate.
Calibration pulse	Standardization pulse. A base to compare the relationship of QRS complexes to one another.
Gain	An increase in amount, magnitude or degree.
J point	The end of the QRS complex; the point where the QRS ends and the ST segment begins (QRS offset).
Limb lead	Bipolar lead that represents the differences of electrical potential between two selected sites (leads I, II, III).
Muscle noise	Grossly uneven baseline caused by patient body tremor or other muscle movement. The artifact may be so large that it overtakes the complex.
Precordial leads	(V1-V6) Unipolar chest leads.
Premature atrial complex (PAC)	An arrhythmia that has its origin in the atrium.
Premature Ventricular Complex (PVC)	An arrhythmia that has its origin in the ventricle.
ST depression	The amount of ST deviation below the baseline.
ST elevation	The amount of ST deviation above the baseline.
ST level	The numerical value of the measured ST segment in microvolts.

ST segment	Ventricular repolarization. The end of the S wave (J point) to the beginning of the T wave.
Tachycardia	A rapid heart rate.

Index

A

AC Filter 1-8
AC Power Operation 2-1
Acquiring and Printing a 12-lead ECG 3-1
Acquiring and Printing a Rhythm Strip 4-1
Acquiring Routine Rhythm Strips 4-1
Apply Power 1-20
Audience 1-1
Auto Delete 1-12
Auto Save 1-14

B

Batch Plotting 5-9
Battery Operation 2-1
Baud Rate 1-11

C

CAPS Lock 1-12
Cart Number 1-15
Cleaning and Inspection 6-5
Cleaning the ELI 100 6-5
Cleaning the Patient Cable 6-5
Cleaning the Writer Printhead 6-5
Configuration Screen Summary 1-6
Configuration Screens 1-7
Conventions 1-1
Copies 1-15
Cueing 1-14

D

Date and Time 1-18
Date Format 1-11
Direct Connection Hookup 5-7
Directory Description 5-1
Directory Maintenance Screen Description 5-6
Directory Screen Sequence 5-2
Downloading a Request List 5-9

E

ECG Activity Screen Description 3-2
ECG Analysis 3-2
ECG Selection Screen Description 3-1
ELI 100 Specifications 1-3
ELI 100 Supply List 1-21
100ELI 100, Illustration 1-2
ELI 100, Two Views: Left Side and Rear 1-4
Erasing a Patient's ECGs 5-4
Erasing a Specific ECG 5-6

F

Figure 1-1 ELI 100 1-2
Figure 2-1 ELI 100 Left and Rear 1-4
Figure 3-1 ELI 100 Rear (Fuse Installation) 1-5
Fuse Installation 1-5

H

Hookup, Patient, 2-2

I

ID Format 1-16
ID Menu Formatting 2-2
ID Menu Prompts 2-3
ID Menu Sequence (Long Format) 2-45
Illustration ELI 100 1-2
Initial Configuration 1-7
Input Mode Selection Screen (WPC) C-2
Inspecting the ELI 100 6-5
Internal Modem Baud Rate 1-14
Interpretation Format 1-9
Introduction 1-1

K

Key Click Volume Setting 1-18

L

Listing a Patient's ECGs 5-5
Load Thermal Paper 1-20

M

Maintenance 6-1
Maintenance on a Specific ECG 5-6
Manual Purpose 1-1
Measurement Matrix (MSR) Description B-2
Measurement Matrix Acronym List B-2
Measurement Matrix Sample (reduced) B-12

O

Operation 2-1

P

Parameters, Operational 1-6
Patient Files, E-SCRIBE 3-4
Patient Hookup 2-2
Patient ID Screen Description 5-5

Patient Preparation 2-2
Patient Selection Screen Description 5-4
Persistent Configuration1-19
Phone Number1-13
Plot Channels1-10
Plot Format1-9
Possible LCD Messages (WPC) C-5
Pre-append site number to patient ID1-13
Printing a 12-lead ECG 3-1
Printing a Directory 5-2
Printing a Rhythm Strip 4-1
Printing the Request List 5-10
Protected Configuration1-7
Protected Configuration Screen A 1-8
Protected Configuration Screen B 1-9
Protected Configuration Screen C 1-9
Protected Configuration Screen D 1-10
Protected Configuration Screen E 1-11
Protected Configuration Screen F 1-11
Protected Configuration Screen G 1-12
Protected Configuration Screen H 1-12
Protected Configuration Screen I 1-13
Protected Configuration Screen J 1-14
Protected Configuration Screen K 1-14
Protected Configuration Screen L 1-15
Protected Configuration Screen M 1-15
Protected Configuration Screen N 1-16
Protected Configuration Screen O 1-17
Protected Configuration Screen P 1-17
Protected Configuration Screen Summary 1-8

R

Rear (Fuse Installation) 1-5
Receiving ECGs 5-8
Request Activity Screen Description 5-9
Request List Downloading 5-9
Request Selection Screen 3-4
Retrieve Serials1-15
Retrieving ECGs from E-SCRIBE 5-9
Rhythm Activity Screen Description 4-1
Rhythm Lead Selection1-17
Rhythm Selection Screen Description 4-1
Rhythm Strip (RHY) Description B-1

S

Scan Functions (WPC) C-3
Select New Channel (WPC) C-3
Setup (WPC) C-2
Sample Print Formats B-1
Selecting a Patient Name 5-4
Selecting a Specific ECG 5-5
Selecting an E-SCRIBE Patient File 3-4
Selecting the ID Menu 2-3
Self-Test Printout Description 6-2
Self-Test Printout Sample, Pg. 1 of 2 6-3
Self-Test Printout Sample, Pg. 2 of 2 6-4
Sending ECGs 5-7
Serial Port1-12
Setting the Date and Time 1-17
Setting the Operational Parameters 1-5
Setup and Installation 1-4
Site Name1-17
Site Number1-15
Special Function Screen Description 5-1
Specifications 1-3
Standard Rhythm Strip Sample (default, reduced) B-4
Starting the System 2-1
Storage Format1-8
Storage Sensitivity1-9
Supplies, ELI 100 1-18
System Description 1-1
System Information Log A-1
System Startup 2-1

T

Taking a Second ECG 3-3
Telephone Connection Hookup 5-7
Time and Date, Setting 1-18
Transmitting ECGs 5-7

U

Units1-11
Updating or Adding Patient ID Information 5-7

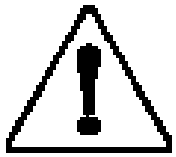
ATTENTION!

TO ACHIEVE MAXIMUM BATTERY LIFE EXPECTANCY, PLUG THE ELECTROCARDIOGRAPH INTO AC CURRENT WHEN NOT USED. THE BATTERIES MUST BE CHARGED 12-24 HOURS BEFORE THE ELECTROCARDIOGRAPH IS USED.

Mortara INSTRUMENT

Milwaukee Bologna Essen Utrecht

MO92 DR: 2



ATTENTION!	INSTALL ENCLOSED FUSE BEFORE OPERATING UNIT.
ACHTUNG!	BEIGEFÜGTE SICHERUNG VOR INBETRIEBNAHME INSTALLIEREN.
ATTENZIONE!	INSTALLARE IL FUSIBILE FORNITOPRIMA DI ACCENDERE L’APPARECCHIO.
ATENCION!	COLOCAR EL FUSIBLE ANTES DE ENCENDER EL APARATO.
ATTENTION!	INSTALLER LE FUSIBLE CI-JOINT AVANT D’UTILSER L’APPAREIL.
OBS!	MONTERA MEDFÕLJANDE SÃKRING FÕRE UPPSTART.

Mortara INSTRUMENT
Milwaukee Bologna Essen Utrecht
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Telephone: (414) 354-1600 Outside Wisconsin: 1-888-Mortara
Fax: (414) 354-4760 http: //www.mortara.com

CAUTION!

Thermal Grid Recording Paper Storage Notes

1. Exposure to sunlight will cause yellowing of the paper and fading of the grid.
2. Store in a cool, dry, dark place, preferably below 80° F and 65% relative humidity.
3. Envelopes and sheet separators made of polyvinyl chloride (PVC), and similar plasticizer-containing material, cause loss of sensitivity of undeveloped paper and fading of printed images. Polyethylene, polypropylene, and polyester are satisfactory as storage containers.
4. Adhesives containing solvents, such as alcohol, ester and ketone, cause developments of the colored coating and should be avoided.

Likewise, most clear self-adhesive tapes cause image fading.

ATTENZIONE!

Istuzioni Per La Conservazione Della Carta Termica Millimetrata Da Registrazione

1. Se esposta alla luce solare, la carta termica ingiallisce e la griglia millimetrata scolorisce.
2. Conservare al buio in luogo fresco e asciutto. La temperatura deve essere preferibilmente inferiore a 26° C e l'umidità relativa del 65%.
3. Buste e fogli di separazione composti di cloruro di polivinile (PVC) e simili materiali contenenti plastificante causano scolorimento delle immagini e perdita di sensibilità della carta non avvolta in buste protettive. Si possono invece impiegare polietilene, polipropilene e poliestere come materiali per contenitori protettivi.
4. Evitare l'uso di adesivi contenenti solventi come alcool, estere e chetone che favoriscono lo sviluppo della pellicola termica con conseguente inscurimento della carta. Allo stesso modo, la maggior parte degli adesivi trasparenti causano lo scolorimento delle immagini.

VORSICHT!

Anmerkungen Zur Aufbewahrung Von Warmegitter-Aufzeichnungspapier

1. Aussezung an Sonnenlicht bewirkt Vergilben des Papiers und Verblassen des Rasters.
2. Aufbewahrungsort soll kuehl, trocken und dunkel sein, vorzugsweise mit einer Temperatur von unter 26.5 Celsius und 65% relativer Feuchtigkeit.
3. Umschlaege und Blattscheider, die aus Polyvinylchlori (PVC) und aehnlichen Plastifikatoren enthaltenden Materialien hergestellt sind, resultieren in Empfindlichkeitsverlusten des nicht entwickelten Papieres und Verblassen der gedruckten Bilder. Polyaethylen, Polypropylen und Polyester sind ausreichendals Aufbewahrungsbehaelter.
4. Klebestoffe, die Loesungsmittel enthalten, wie zum Beispiel Alkohol, Ester und Keton, verursachen die Entwicklung der Farbschicht und sollten vermieden werden.

Auch bewurken die meisten transparenten, selbsthaftenden Klebstreifen ein Verblassen der Bilder.

ATTENTION!

Instructions Sur Le Stockage Du Papier Quadrille D'engegistrement Thermique

1. Si le papier reste exposé àla lumière du jour, il jaunira et le quadrillage se decolorera.
2. Conserver dans un endroi frais, sec et sombre ayant de préférence une température de moins de 26.5° C. et une humidité relative de moins de 65%.
3. Les enveloppes ou séparations faites en chlorure de polyvinyle ou autre substance contenant un plastifiant semblable pourraient causer une perte de sensibilisation du papier non developpé et la décolorationdes papiers déjà imprimés. Les enveloppes en polyethylène polypropylène et polyester peuvent être employées.
4. Eviter d'employer tout adhésif à base de dissolvants tels que de l'alcool, ed l'ester et de l'acétone car il pourrait causer le développement de la couche colorée du papier.

Pour la même raison, la plupart des papiers collants transparents cousent la décoloration des images.

CUIDADO!

Papel Registrador De Malla Thermal Instrucciones De Almacentamiento

1. La exposición a la luz del sol producirá un color amarillento en el papel y descoloramiento de la rejilla.
2. Manténgase en un lugar fresco seco y oscuro, de preferencia a una temperatura de 26.5 C y a una Humedad Relative de un 65%.
3. Sobres y separadores de páginas fabricados de cloruro de polivinil (CPV) y de materiales que contienen plásticos, producen pérdida de sensibilidad del papel no revelado e impresión de imágines descoloridas. El polietileno, polipropileno y el poliéster son recipientes apropiados para almacenamiento.
4. Adhesivos que contienen solventes tales como alcohol, éster y acetona producen el revelado de la capa de color y no deben ser empleados.

La mayoría de las cintas adhesivas transparentes producen tambien imágines descoloridas.

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